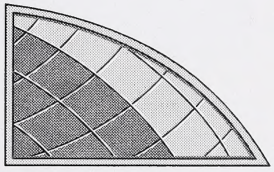
Climate Change Round Table



Alberta
GOVERNMENT OF ALBERTA

ALBERTA
ECONOMIC DEVELOPMENT AUTHORITY

Workbook

Printed on Recycled Paper

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Note

This Workbook was developed to help delegates prepare for Alberta's Climate Change Round Table, April 30 – May 1, 1999, and to assist the public in providing input regarding issues and opportunities associated with climate change. Several delegates and organizations suggested that this Workbook continue to be available following the Round Table because of the useful information it provides.

Delegates at the Round Table recommended that Alberta show leadership in acting on climate change and that we do so in ways that are environmentally responsible while maintaining or improving Alberta's economic advantage. The Round Table endorsed establishing a partnership of government, business and other stakeholders — "Climate Change Central" — to lead and coordinate Alberta's action. Premier Ralph Klein committed Alberta to these steps.

Climate Change Central will continue to maintain the Round Table's web site (www.climatechange.ab.ca) and toll-free line (1-888-476-1554) to ensure dialogue with stakeholders continues.

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Dear Alberta resident,

On behalf of the Premier, the Government of Alberta and the Alberta Economic Development Authority, thank you for your interest in "Alberta's Round Table on Climate Change: Turning Strategy into Action."

Whether you are one of the Round Table participants or whether you are completing this workbook from your home or office, we look forward to your input.

We hope this workbook will help you share your ideas on climate change. It was designed with one question in mind: "Why is this Round Table important to Alberta?" The answers came quickly:

- Because something needs to be done.
- Because Alberta has shown the commitment to reducing greenhouse gas emissions.
- Because we can build on the momentum shown by Albertans and Alberta organizations.
- Because Albertans need to learn more about reducing greenhouse gas emissions.
- Because we need a realistic, achievable plan of action to tackle this issue in striking the right balance.

We can build on the many examples of good work and leadership that Albertans have already shown in reducing greenhouse gas emissions. We can also build on this government's commitment to taking precautionary measures to reduce greenhouse gas emissions, while maintaining our competitiveness.

Through this workbook and Round Table, you can contribute to Alberta's action on climate change. On the heels of this Round Table, we will put forward recommendations and detailed action steps. To ensure the success of Alberta's action plan, we will also outline a proposed structure for coordinating and managing Alberta's actions.

Thank you for your interest in a stronger, better Alberta where we continue to enjoy an Environmental Energy Advantage and a standard of living that is among the best in the world.

Sincerely,

Elaine McCoy
Chair, Task Force on Climate Change
AB Economic Development Authority

Guy Boutilier, MLA
Chair, Cabinet Committee on Climate Change
Alberta Government

1. Introduction

1.1 Why are we here?

Welcome to Alberta's Round Table on Climate Change.

Here in Alberta and around the world, there is a growing awareness of the issue of climate change and its potential impact not only on our environment but also on our economy. By and large, much of the focus has been on reducing greenhouse gas emissions. One of the largest sources of greenhouse gas emissions is carbon dioxide produced when fossil fuels like coal, oil and natural gas are burned. As a primary beneficiary of the world's reliance on fossil fuels, Alberta has a lot at stake in any discussions about strategies to reduce emissions of greenhouse gases, here and around the world.

There is also a growing sense in Alberta that we need to begin to chart our own course for addressing the issue, bringing together people from various segments of our economy and communities, identifying the critical issues and opportunities, and setting out specific actions that could be taken in the province.

The Alberta Economic Development Authority (AEDA) convened a Task Force of representatives across business sectors in the province, and presented its recommendations to the Alberta Government last fall. AEDA recommended that Alberta respond to climate change with a prudent, coordinated strategy that includes all Albertans. AEDA also took the position that future actions with respect to climate change and their associated costs must be reasonable and rational in relation to the risk, the science and Albertans' desire for future economic prosperity.

On October 15, 1998, the Alberta Government announced its Climate Change Strategy. Consultations were held with municipal leaders, academics, industry and environmental stakeholders. The conclusion was that a "do nothing" posture would not satisfy Albertans' desire to take control of addressing the issue of climate change, rather than letting others take the initiative in ways that might put Alberta's energy intensive economy at risk and jeopardize the standard of living Albertans enjoy.

Alberta's Climate Change Strategy lays out a broad framework. It calls for precautionary measures — which means incurring prudent costs to achieve best efforts in reducing the growth of emissions. It recommends that Alberta should promote the wise use of energy resources and the Environmental Energy Advantage. It also sets out six key action areas:

- **Undertaking scientific and technological research in conjunction with industry and universities on ways to improve energy use**

- **Encouraging business and individual action to improve energy productivity**
- **Taking action within government to improve energy efficiency in government operations**
- **Participating in economic analysis of issues such as multi-sectoral economic impacts and initiatives underway in other countries**
- **Working with the private sector to develop a communications plan to promote Alberta's Environmental Energy Advantage**
- **Establishing Climate Change Central, a government/ private sector partnership to engage Albertans in public discussion and education about climate change and energy efficiency.**

That's the broad strategy. A copy of the Strategy is included in the back sections of this workbook.

In his televised address in February, Premier Klein announced the next step in Alberta's plans for addressing climate change issues — a Climate Change Round Table bringing industry, government and environmental leaders together to develop a joint plan — "complete with specific actions — for reducing Alberta's greenhouse gas emissions." The message is straightforward: Government has set the framework, but they can't do it alone. The next steps are up to all of us.

The Round Table is jointly chaired by Guy Boutilier, MLA for Fort McMurray and Chair of the Cabinet Committee on Climate Change, and Elaine McCoy, President of the Macleod Institute for Environmental Analysis at the University of Calgary, and co-Chair of the Alberta Economic Development Authority's Climate Change Task Force.

The challenge for participants at the Round Table is to take the framework, examine what is happening today in Alberta and around the world, look at the risks of taking certain courses of action, decide what could and should be done, what goals should be set and how success would be measured.

The purpose is to analyse the government's Climate Change Strategy, discuss alternatives for action, and begin to put the meat on the bones — to chart Alberta's course for addressing climate change issues.

Specifically, we want participants to address three overarching questions:

1. **What broad approach should Albertans take?**
2. **What actions can and should be taken and who is responsible for what?**
3. **What are the elements needed to turn Alberta's Climate Change Strategy into action?**

Alberta has demonstrated that it can build prosperity in the face of external challenges when the people and the government of Alberta come together to take decisive action in a prudent manner. Working as a team and adopting a balanced, reasonable goal, Albertans have shown independence and innovation in creating the Alberta Advantage. To sustain this Advantage, and begin to promote an Environmental Energy Advantage, Albertans now need to take a leadership role in addressing climate change issues.

1.2 Who is participating in the Round Table?

Across the province, Albertans are already responding to the climate change challenge. But many are looking for direction and specific ideas about steps that can be taken. Many are also looking for broader participation before they take further action. A number of Albertans have expressed a willingness to play a role, but are seeking a clear provincial framework for action that would allow them to better understand how their actions contribute to an effective provincial strategy.

The challenge is to find ways to engage individuals on a personal level as well as people from the various sectors — to share ideas, discuss options, and develop Alberta's strategies and solutions. The Round Table brings together people from a broad cross section of Alberta's private and public sectors — business and industry leaders, academics, municipal leaders, labour, health organizations, environmental groups, and individual Albertans.

A list of all participants at the Round Table on Climate Change is included at the back of this workbook.

People who are not participants at the actual Round Table discussions will also be able to participate. A website has been set up (www.climatechange.gov.ab.ca) and contains the same material as this workbook. The workbook also will be available in hard copy to interested Albertans on request (1-888-476-1554) and their feedback will be welcomed.

1.3 Format for the Round Table discussions

The Round Table has been structured to take participants through a series of discussions building to agreement in six critical areas. The objective is to reach agreement on:

1. **Whether something needs to be done**
2. **Whether something can be done**
3. **What actions can and should be taken**
4. **How those actions can be accomplished and who is responsible for what**
5. **What goals we should aim for and how should we measure success**
6. **How do we proceed.**

This workbook has been prepared to provide basic background information and to guide participants through a number of issues and questions in order to reach consensus on those six critical areas.

Participants are encouraged to go through the workbook in advance of the Round Table session, make comments and jot down ideas as you are reviewing the material, and also bring additional information and articles you may want to share at the Round Table discussions. The workbook is intended simply to stimulate discussions and provide a common starting point.

At the start of each section of the workbook, you will find a "roadmap" outlining the purpose of the section and linking it back to the six critical agreements noted above. At the end of the day, the objective is to have reached consensus wherever possible. Where consensus has not been reached, the objective is to capture and record all of the ideas and suggestions from each of the sessions.

This package also includes a bibliography. A separate primer and glossary have been prepared to give you more background.

Notes

2. Background information

Your roadmap to section 2

Starting points

This section provides basic background information — what is the issue, what are some of the facts about greenhouse gas (GHG) emissions and their sources, why are people concerned, how do Alberta and Canada stack up, what is happening in Alberta and in other jurisdictions.

Review this information, consider the ideas and challenges, and use this as a backdrop to consider whether:

1. **Something needs to be done.**
2. **Something can be done.**

2.1 The climate change challenge

Climate change is one of the most important environmental, economic and social issues facing not only Alberta but all countries around the world.

"For years, the world's population has produced emissions of greenhouse gases that have been released into the Earth's atmosphere. Little thought was given to the impact of these emissions on our planet until the 1980s. That's when the international scientific community began to debate the link between increased manmade greenhouse gas emissions and global climate change." (The Climate Change Chronicles, Volume #1, 1998)

Today, international pressures are building to respond to the climate change challenge. While there may be scientific disagreements on the causes of climate change and the impact of greenhouse gases (GHGs), countries around the world have decided that the risks of climate change are simply too serious to ignore.

By and large, the response to the climate change challenge has focused on reducing greenhouse gas emissions caused by human activities. One of the largest sources of greenhouse gas emissions is carbon dioxide produced when fossil fuels such as coal, oil and natural gas are burned.

Energy consumption and use of materials and natural resources drive emissions, yet these activities also drive the global economy. Industrialization has thrived on what, for many decades, appeared to be an abundant, though non-renewable, supply of relatively inexpensive resources, particularly energy. Alberta has been a beneficiary of the world's reliance on fossil fuels, developing and exporting the bulk of its coal, oil and natural gas resources for

consumption by individuals, industries and institutions in other parts of North America and the world.

In recent years, however, the burden that industrialization places on global resources has received as much attention as its benefits. *Our Common Future*, a report issued by the World Commission on Environment and Development (the Brundtland Commission) in 1987, coined the phrase "sustainable development", and defined it to mean "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Five years later, the United Nations Conference on Environment and Development (the Earth Summit held in Rio de Janeiro, Brazil) overwhelmingly adopted the principles of sustainable development.

Since then, sustainable development has been adopted as an operating principle by governments, businesses, non-governmental organizations and individuals throughout the world. The Government of Alberta, for example, embraced sustainable development when it introduced the *Environmental Protection and Enhancement Act* in 1992, and recently confirmed its position in the policy statement, *Alberta's Commitment to Sustainable Resource and Environmental Management*. For many, it is simply a matter of good business practice to apply the principles of sustainable development. Competitive advantage increasingly emphasizes the wise use of resources.

The challenge is to respond to climate change in a manner that is consistent with the principles of sustainable development.

Sustainable development is not a fixed state of equilibrium. It is a process of change in which contributions to people's quality of life through the exploitation of resources, the direction of investments, the orientation of technological development, and the implementation of new institutional and individual practices are made consistent with future and present environmental and social needs. Nevertheless, current international responses to climate change tend to emphasize static targets. The magnitude and means of achieving proposed greenhouse gas emission reductions, both in Canada and in Alberta's major trading partners, present a potential threat to Alberta's future prosperity.

The challenge is to respond to climate change in a manner that is consistent with the principles of sustainable development.

2.2 Some facts about climate change

Greenhouse gases are produced by the cars we drive, the furnaces we use to heat our homes, and the industries that pump oil and gas, create electricity, and develop products for Alberta's and the world's marketplace. Many of these activities are powered by fossil fuels — coal, oil and natural gas.

Greenhouse gases in order of relative current importance to climate, are water, carbon dioxide (CO_2), ozone, methane, nitrous oxide, and hydrofluorocarbons. From a climate change perspective, CO_2 is the most important greenhouse gas — its radiative impact is second only to that of water. Estimates are that

In case you forgot,

1 megatonne = 1,000,000 tonnes
= 1000 kilotonnes

1 kilotonne = 1000 tonnes

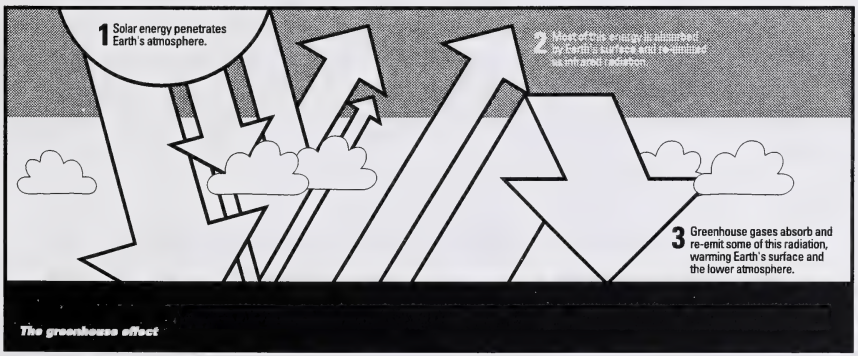
1 tonne = 1000 kilograms
= 2200 lbs (1.1 tons)

human activities add over 5000 megatonnes (five billion tonnes) of carbon dioxide to the atmosphere each year. The majority of those emissions is due to the combustion and use of fossil fuels and cement production. Burning fossil fuels produces emissions of the three main greenhouse gases — carbon dioxide, methane and nitrous oxide.

Not all greenhouse gases are produced by human activities. In fact, some greenhouse gases occur naturally in our environment and are essential to survival. These naturally occurring greenhouse gases trap heat near the Earth's surface and prevent it from escaping into space. Without these greenhouse gases, the world would be a cold and uninhabitable place. The natural greenhouse gas effect gives Earth an average global temperature of 15°C. Without it, the average temperature would be 33°C colder, and Earth would be a frozen planet.

But there is growing concern about increasing greenhouse gas emissions caused by human activities and the impact on the Earth's climate. These gases are particularly effective in absorbing long wave radiation from the earth's surface and preventing heat from escaping (Figure 1). The concern lies in the potentially negative effects on the global climate if the concentration of greenhouse gases continues to increase, trapping more and more heat in the world's atmosphere.

Figure 1
The greenhouse effect



Source: CEPA-CGA "The Climate Change Chronicles" Vol. 1

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was set up to investigate the possible link between increased concentrations of manmade greenhouse gas emissions and global climate change.

The IPCC found that:

- The levels of methane in our atmosphere have more than doubled during the past 200 years

- Carbon dioxide concentrations are 20% higher than the highest concentrations of the past 160,000 years
- Human activities have added new greenhouse gases to the atmosphere.

The scientists concluded that increased greenhouse gases in our atmosphere caused by human activities are contributing to global warming. They also concluded that rising temperatures are triggering a series of changes within the overall climate system. The IPCC estimates that if these emissions of greenhouse gases are not reduced, the global mean surface temperature may rise by about 1°C by 2025 and by 3°C by the end of that century.

Some scientists disagree. They suggest that the increase in global mean temperature is within the range of natural variations in the Earth's temperature. Some believe the current warming trend is simply part of a larger pattern of naturally occurring temperature changes the Earth has experienced, pointing to fluctuations in the earth's temperature over the past million years. In more recent history, there also have been several warming and cooling periods. In the 1940s, a warming period occurred, followed by moderate cooling into the mid 1970s and a pronounced warming period in the 1980s.

Scientists do not necessarily agree on the impacts associated with increasing greenhouse gas emissions and their concentration in the atmosphere. But the world community has decided that the risks of climate change are simply too serious to ignore.

Scientists do not necessarily agree on the impacts associated with increasing greenhouse gas emissions and their concentration in the atmosphere. But the world community has decided that the risks of climate change are simply too serious to ignore. Here in Alberta, the province's Climate Change Strategy takes a similar position. The risk of greenhouse gas emissions contributing to climate change warrants precautionary measures and incurring prudent costs to achieve the best efforts in reducing the growth in emissions.

2.3 What are the major factors contributing to greenhouse gas emissions?

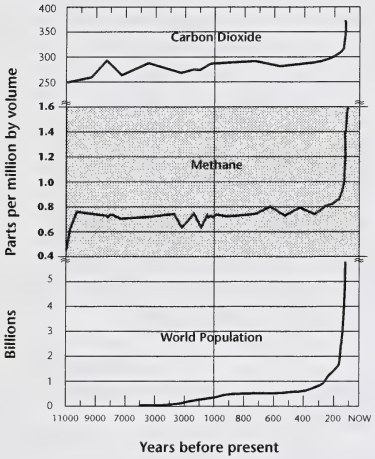
The human connection to climate change

(adapted from The Climate Change Chronicles, Volume #1, 1998, produced by the Canadian Energy Pipeline Association and the Canadian Gas Association)

The concentrations of greenhouse gases in our atmosphere have increased due to a wide variety of human activities.

World population has jumped exponentially to more than six billion, ten times greater than at the beginning of the eighteenth century. This population boom has increased the need for industrialization to meet the rising demand for food, clothing, shelter and a growing list of modern conveniences. Information in Figure 2 shows the correlation between the growth of greenhouse gas emissions over time and the growth in the world's population.

Figure 2
Carbon dioxide and methane vs. world population over time



Source: From several sources

Human activities directly add about 5000 megatonnes of carbon dioxide to the atmosphere each year.

Since the Industrial Revolution, the world has become increasingly reliant on fossil fuels such as oil, natural gas and coal to provide heat for our homes, fuel for transportation and power for industry.

Agriculture also produces greenhouse gases. However, the major agricultural GHGs are methane and nitrous oxide rather than carbon dioxide. Nitrous oxide is produced by fertilizers used to grow crops, while rice paddies and the digestive processes of animal herds produce methane. Nitrous oxide also is produced by burning biomass, a combination of organic material such as plants and manure, for heat. Biomass is a major energy source for nearly half the world and provides 35% of all energy used in developing countries.

Human activities directly add about 5000 megatonnes of carbon dioxide to the atmosphere each year. But our activities can also have an indirect impact on the amount of emissions released into the atmosphere. World demand for wood products, together with expanded agricultural production, has increased deforestation of the planet. This can change Earth's reflectivity which helps determine the amount of solar energy that is either absorbed or reflected by the surface. Trees also act as carbon sinks, removing carbon dioxide from the atmosphere.

Forests and wetlands absorb and store greenhouse gases as part of the natural regulation of the atmosphere. Removing forests can, in some cases, remove a natural sink for carbon dioxide. As well, GHGs can be emitted from burning of forests or firewood. Essentially, changes to the natural landscape can alter the balance of GHG emissions and sinks. For example, as sections of temperate forests are replanted, additional CO_2 is removed. However, if tropical forests are slashed and burned for agriculture, CO_2 emissions increase and a natural sink is lost. Each year, the world 'releases' or fails to capture an additional 1000 to 1500 megatonnes of carbon dioxide because of a reduction in the number of forests and wetlands.

2.4 Why are people concerned?

No one knows for certain what effect global climate change will have on our world. No one knows for certain what absolute level of greenhouse gas atmospheric concentrations would be tolerable or what levels would likely not affect long-term global temperature averages.

Climate change could have both positive and negative impacts on the way we live and work. On the one hand, a rise in temperature in one region of the world could mean a longer growing season or new fishing species. Changing temperature and precipitation patterns could boost agricultural productivity in some areas and decrease it in others. Existing studies show that, on the whole, global agricultural production could be maintained in the face of climate change projections.

On the other hand, the negative impacts could be severe. Low lying coastal areas could be flooded. Growing conditions for animals and crops could be disrupted. Established patterns of settlement, production and commerce would be dislocated, creating the need for massive restructuring in terms of social foundations and economic investment. An increase in the intensity and frequency of heat waves could cause tropical diseases to move to new areas where people have little or no immunity. One third of the earth's existing forested areas could undergo changes in broad vegetation types because climate change will occur more quickly than forest species can grow, reproduce and re-establish themselves.

Information suggests that Canada has a significant interest in the risks posed by climate change because our economy depends so heavily on resource-based industries that are sensitive to shifts in weather patterns. Certainly, that is true of many Alberta industries.

Agriculture, forestry, fisheries and resource extraction could face a direct impact through changing trade patterns.

Warmer temperatures caused by climate change could increase sea levels and increase the risk of flooding and erosion. Rising saltwater levels could threaten freshwater supplies, drainage and sewage treatment systems. In western Canada, the southern edge of the boreal forest could be pushed northward by as much as 1,100 kilometres. Some forest regions may simply die as a result of warming temperatures, drought and increased pests.

However gradual and uncertain the onset of climate change may be, so far as anyone knows, it would be impossible to reverse the consequences of global warming — after it has happened.

The net social and economic impact of climate change on the world is not known. Much of it depends on geographic location and how we adapt to change. However gradual and uncertain the onset of climate change may be, so far as anyone knows, it would be impossible to reverse the consequences of global warming — after it has happened.

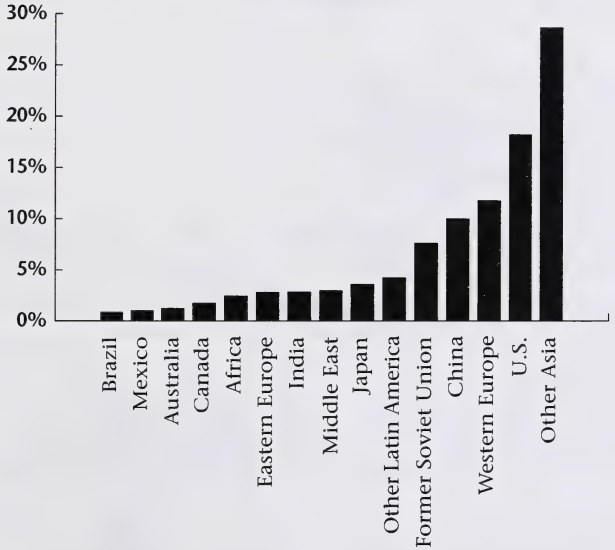
2.5 How do Canada and Alberta stack up?

Contributions to greenhouse gases worldwide

Figure 3 shows that the United States, developing Asia and western Europe are the leading emitters of carbon dioxide. Canada ranks 11th overall. Canada, with roughly one half of one percent of the world's population, is responsible for approximately 2% of the world's total emissions of greenhouse gases, counting emissions at source.

Canada's Energy Outlook estimates that Canada emitted 599 CO_2 equivalent megatonnes in 1990, and predicts that emissions will rise to 703 megatonnes by 2010. While the percentages of emissions coming from Canada may be relatively small, Canada has one of the highest levels of emissions when that is counted on a per capital basis. Ontario and Alberta are Canada's largest contributors to greenhouse gas emissions. The primary cause of Ontario's emissions is consumption of energy while Alberta's is the production of energy.

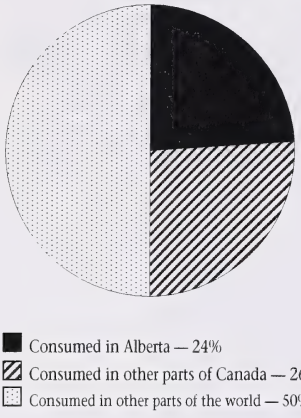
Figure 3
World total CO_2 emissions – 1996



Source: Energy Information Administration/International Energy Outlook 1998

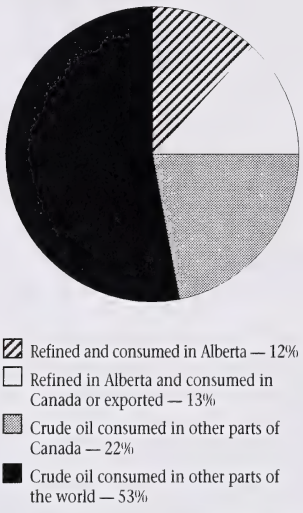
Approximately 200 megatonnes of CO_2 equivalent emissions are attributed to Alberta, of which 55.5 megatonnes are associated with fossil fuel production. However, roughly 75% of the natural gas and 88% of the crude oil produced in Alberta is destined for consumption either in other parts of Canada or exported to other countries (Figures 4 and 5).

Figure 4
Destination of Alberta natural gas



Source: Alberta Energy and Utilities Board/Statistics Canada

Figure 5
Destination of Alberta crude oil and equivalents

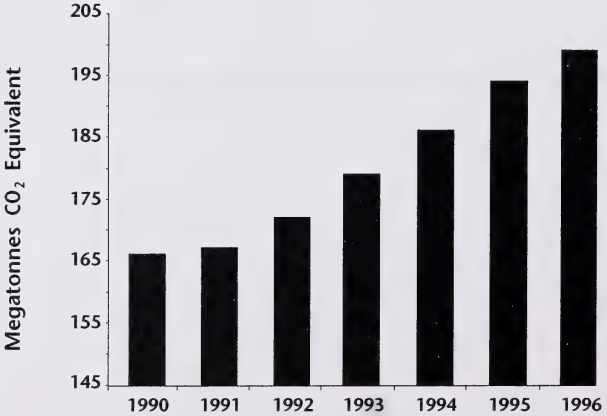


Source: Alberta Energy and Utilities Board/Statistics Canada

Since 1990, Alberta's greenhouse gas emissions have increased by about 20% (Figure 6). A key driver of Alberta's greenhouse gas emissions is the Canadian and world demand for many of the commodities produced in the province, especially our energy commodities. Alberta's vibrant economy has also resulted in increases in greenhouse gas emissions, particularly because the dynamic sectors of the economy are tied to energy production and

Figure 6
Alberta greenhouse gas emissions

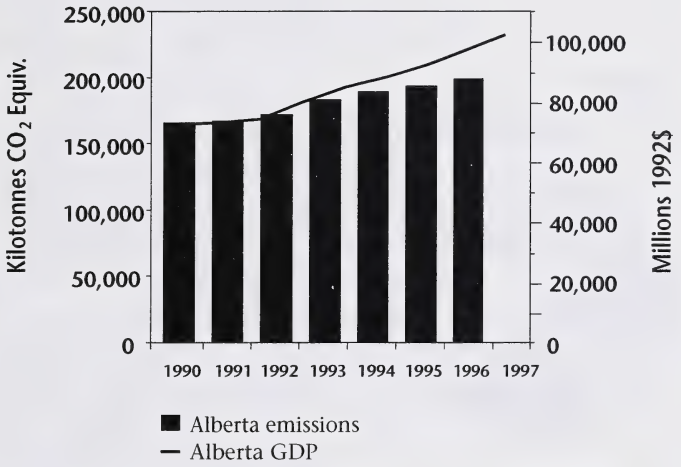
Source: Enviroment Canada



use. As a result, greenhouse gas emissions have closely tracked Alberta's economic growth (Figure 7). Between 1990 and 1992, Alberta's emissions tracked the growth in GDP almost one to one.

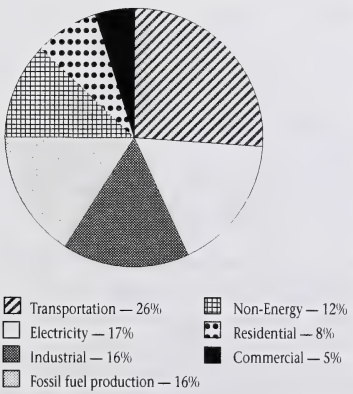
Figure 7
Alberta GHG emissions compared to economic growth

Source: Environment Canada/ Statistics Canada



Since 1992, and especially since 1995, however, the trend has been broken. This 'decoupling' is due to a number of factors, including increased energy efficiency within industry and the continued diversification of Alberta's economy.

Figure 8
Where are Canada's emissions coming from?



Source: Natural Resources Canada, 1995

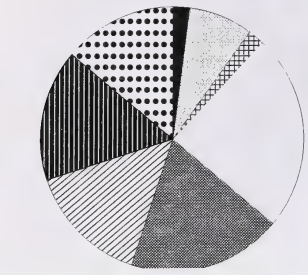
Major sources of greenhouse gas emissions in Canada and Alberta

A look at the major sources of greenhouse gases in Canada shows that more than half of the country's greenhouse gases from human activities are associated with transportation, along with lighting and heating for homes and businesses. In 1996, at least 80% of Canada's total greenhouse gas emissions resulted from the use of fossil fuels to power our factories, office buildings, homes and cars (Figure 8).

The usual way of showing Alberta's sources for greenhouse gas emissions emphasizes that the biggest proportions are associated with fossil fuel industries and electricity. However, the emissions data associated with individual, industrial, commercial and institutional consumption of fossil fuels and electricity are rarely presented on a fully distributed basis. "Fully distributed" means that emissions have been allocated across sectors, attributing emissions to end users regardless of whether they were emitted at

the time of producing the fuel or electricity or when it is subsequently used by customers to power factories, office buildings, homes or vehicles. Figure 9 is a *very rough* approximation of the distribution of emissions, based on a number of broad assumptions regarding the use of Alberta's natural gas, oil and electricity within the province. It shows, by order of magnitude, the kinds of activities that are driving emissions by energy consumption and use of materials and natural resources produced within Alberta.

Figure 9
Alberta GHG emissions (fully distributed)



Source: Derived from Alberta Energy and Utilities Board/Statistics Canada data

Notes: 1. Emissions Associated with exported fossil fuels have been netted out of this data.

2. This figure is a very rough approximation of the distribution of emissions, based on a number or broad assumptions regarding the use of Alberta's natural gas, oil and electricity within the province.

Figure 9 gives an indication of who might take action in responding to the climate change challenge in Alberta and illustrates that individuals, businesses and industry all have a role to play. However, this point of view is often lost in discussions about how to design and implement programs to reduce greenhouse gases. Emphasis is more frequently placed on emissions at source, that is, on primary and secondary energy producers. Part of the reason for this focus is the relative ease of reporting statistics, as a comparatively small number of corporations produce coal, oil, natural gas and electricity. Regulators are sometimes attracted to policies which appear to offer the advantage of administrative simplicity.

Taking action in Alberta and across Canada

Check out the examples section for more information about what's happening in Alberta.

In Canada and in Alberta, important steps are being taken by individuals, business and industry, municipalities, institutions, and governments to reduce greenhouse gas emissions.

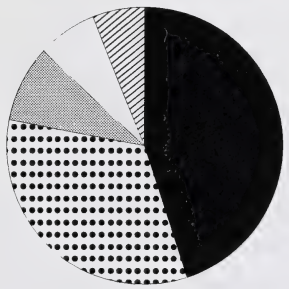
The federal and provincial governments established the National Action Program on Climate Change in the early 1990s. A key component of that program is the Climate Change Voluntary Challenge and Registry (VCR). The VCR encourages industry, government and other organizations to develop action plans to voluntarily reduce greenhouse gas emissions, monitor progress and report on results. Industry participation in the VCR is growing.

Alberta businesses, industries, institutions and governments are taking the lead in participation in the VCR program. Of the 14

awards presented by the VCR in February 1999, nine of the winners were from Alberta — including winners in the educational institution, government, electric utility, oil and gas, association leadership and individual leadership categories.

There are numerous examples of steps being taken in Alberta and across Canada. Many of those examples are described at the end of this section.

Figure 10
Canada's per capita personal greenhouse gas emissions



Source: Enviroment Canada, 1990

Individual consumers have a role to play

It may be easy to point to the producers of greenhouse gas emissions and say, that's where the solution lies. But the reality is that individual consumers also have a big role to play because the decisions people make affect both the consumption of energy and the types of products that are produced.

Every product we consume requires energy to produce. Every time we put our foot on the gas pedal, move the thermostat up a notch or purchase manufactured goods or agricultural produce, we are responsible for producing greenhouse gas emissions.

A look at emissions for Canadians shows that personal emissions account for about 25% of Canada's greenhouse gas emissions. Each Canadian is responsible for 5,425 kilograms of greenhouse gas emissions annually — roughly the weight of a full grown bull African elephant, or about 90 average adult humans. Cars make up for 45% of those emissions, followed by space heating at 33%, lights at 9% and hot water at 7% (Figure 10).

Think about this . . .

The average Canadian family uses up to 12 trees every year in paper products. Most of these products end up in garbage dumps and landfill sites.

The average Canadian household throws out one tonne of garbage every year. More than half of all the solid waste collected in Canada is made up of consumer or household garbage.

Driving faster may get you to your destination sooner but it burns more fuel and causes more pollution for the same distance. Driving 100 kilometers per hour uses 10 % more energy than driving at 90 kilometres per hour.

Canada has one of the highest ratios of car ownership in the world, with close to one vehicle for every two Canadians.

One busload of passengers takes the equivalent of 40 vehicles off the road, saving 70,000 litres of fuel and avoiding the emission of nine tonnes of pollutants a year.

Source: The Climate Change Chronicles, Volume #4, 1998

2.6 Actions and initiatives around the world

Climate change is a global issue and so the response to climate change has been initiated at the international level.

International agreements

The 1992 United Nations Framework Convention on Climate Change (FCCC) has been ratified by over 160 countries, including Canada. It took effect on March 21, 1994.

It sets an "ultimate objective" of stabilizing "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system." The objective does not, however, specify what those concentrations should be. The FCCC does state that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

Since 1992, numerous meetings have been held in an attempt to put some definition on FCCC's objective, particularly with respect to a timeframe and to developing national programs to slow the growth rate of greenhouse gas emissions in industrialized countries. Although some progress has been made, it is not yet certain what measures will be agreed to in the final analysis, nor is it certain which countries will agree to be bound by specific terms. Iceland, for example, where reductions in the order of 75% had already been achieved, recently announced that it will *not* ratify a protocol setting targets. And last month, two U.S. Senators introduced legislation to address potential climate change issues by shifting the focus from narrowly applied, short-term emissions reductions targets to a long-term, technology-based global effort.

Environment, technology and competitiveness

Environmental challenges are being turned into competitive advantages.

With or without the impact of international agreements, some economists and business leaders are pointing to the need for business and industry to take a leadership role in addressing environmental issues such as greenhouse gas emissions, not just to sustain the environment, but to improve their competitive advantage and avoid getting left behind.

Michael Porter, a professor at the Harvard Business School, makes the case for turning environmental concerns into a competitive advantage. In his view, "The conflict between environmental protection and economic competitiveness is a false dichotomy. It stems from a narrow view of the sources of prosperity and a static view of competition." (*America's Green Strategy*, Scientific

American, April 1991) In his view, American companies spend more time and money fighting environmental regulations and, in the process, they are getting left behind while businesses in other countries develop the technology to give them a competitive advantage. He argues for a new approach to regulation, one that has the right incentives and encourages innovation.

Amory Lovins makes a similar point about the need to look at the competitive advantage of addressing environmental issues. He suggests that the earth's climate can be protected not at a cost but at a profit — just as many industries are already turning the costs of environmental compliance into the profits from pollution prevention. "Thus, the climate debate should not be about pain, prices, and penury, but rather about profits, markets, enterprise, innovation, competitive advantage, and economic opportunity." (*Climate Change: Making Sense and Money*)

He attacks what he calls "myths" underlying the conventional climate debate:

- *It's about climate science.* No; we ought to be purchasing energy efficiency anyway just to save money.
- *It's about decision-making under uncertainty.* The robust economic benefits depend only on private internal costs and benefits, not on any imputed environmental values or risks.
- *It's about carbon taxes.* No; present prices are ample to solicit all the energy savings we need — if we just get serious about vaulting the barriers that inhibit people from using energy efficiently.
- *It's about command-and-control.* Wrong; it's about helping markets to work properly — and then letting them do their job.
- *It's about who should bear the costs.* What costs? The interesting question is who should get the profits.
- *It's about sharing sacrifices for the common good.* No; it's about helping individuals, firms, and nations to behave in their own self-interest.
- *It's about "cutting back", shifting to a lifestyle of privation and discomfort.* No; it's about living even better with less cost, by using smarter technologies that yield the same or better service.
- *It's about keeping the poor down.* Energy efficiency could be a boost for those most burdened with the least efficient buildings and equipment.
- *It's about consuming too much in the North and not enough in the South.* That's a real issue, but the resource-efficiency revolution can simultaneously sustain or enhance Northern and greatly improve Southern living standards.

The automotive industry is a case where Japanese carmakers, Honda and Toyota, are taking an environmental challenge and turning it into a competitive advantage. They are already exhibiting gasoline-sipping hybrid cars that are partially powered by electric motors. These cars are now on sale and demand is so great that Toyota is opening a second plant. The United States automakers have nothing similar to market yet but they are all aggressively pursuing solutions. Industry analysts are saying that "The payoff is years down the road, but the penalty for being out of the race could be severe." "Both Honda and Toyota understand that there are global challenges to be met that are integral to the design of their vehicles. Unfortunately, what's seen as an opportunity in Japan is something to be avoided here." (*"Japanese holding the green advantage"*, Calgary Herald, February 26, 1999)

The same is happening closer to home. Based in Burnaby, British Columbia, Ballard Power Systems Inc. is leading in the development of cars powered by fuel cells. DaimlerChrysler and Ford Motor Company have invested about $750 million in a partnership with Ballard. The first compact car produced by DaimlerChrysler seats five people, goes 450 kilometres before refueling, and has a top speed of 150 kilometres an hour.

Compared with a traditional gasoline combustion engine, the difference in carbon dioxide emissions from a fuel cell powered car is dramatic. A gasoline combustion engine emits 0.85 lb. of carbon dioxide per mile while the fuel cell running on renewable hydrogen emits no carbon dioxide at all. Even when the fuel cell is running on hydrogen produced by methane, the carbon dioxide emissions are reduced to 0.15 lb. per mile.

The key point of these examples is that companies are moving forward with new ideas, ideas where they can see a competitive advantage in the future by addressing environmental issues.

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Many of these solutions and ideas involve new advances in technology. And the conclusion from some is that technology in itself will provide the answers to environmental issues we face today. Other experience suggests that it would be wrong to conclude that technology alone will provide the answers. Closer to home, EPCOR Utilities has been working closely with Howell-Mayhew Engineering on a number of projects. Their conclusion is that: "It should not be automatically assumed that a technical fix is the solution to an environmental problem. Only about 5% of any environmental solution is based on the technical component." The solution also has to meet regulatory challenges, it has to be ethical, and it has to fit the social values of the community. Even the best technology does no good if it is not or can not be used.

Paul Hawken, in an article called *"Natural Capitalism"* makes the case that countries and businesses need to take a new approach to defining capital — an approach that includes not just accumulated wealth in the form of investments, factories and

equipment, but also the resources we use, both nonrenewable and renewable. Future businesses have to take natural resources into account. He calls for reducing waste in production and manufacturing and a new taxation system to reward investments in people and wise use of natural resources. In his words, "In 1750, few could imagine the outcome of industrialization. Today, the prospect of a resource productivity revolution is equally hard to fathom. But this is what it promises: an economy that uses progressively less material and energy each year and where the quality of consumer services continues to improve; an economy where environmental deterioration stops and get reversed as we invest in increasing natural capital; and finally, a society where we have more useful and worthy work available than people to do it."

Copies of selected articles and a bibliography of additional articles are included at the back of this workbook.

Think about this . . .

For anyone who doubts the innate value of ecosystem services, the $200 million Biosphere II experiment stands as a reality check. In 1991, eight people entered a sealed, glass-enclosed, 3 acre living system, where they expected to remain alive and healthy for two years. Instead, air quality plummeted, carbon dioxide levels rose, and oxygen had to be pumped in from the outside to keep the inhabitants healthy. Nitrous oxide inhibited brain function. Cockroaches flourished while insect pollinators died, vines choked out crops and trees, and nutrients polluted the water so much that the residents had to filter it by hand before they could drink it. Of the original 25 small animal species in Biosphere II, 9 became extinct.

At the end of 17 months, the humans showed signs of oxygen starvation from living at the equivalent of an altitude of 17,500 feet. Of course, design flaws are inherent in the prototype, but the fact remains that $200 million could not maintain a functioning ecosystem for eight people for 17 months. We add eight people to the planet every three seconds.

The lesson of Biosphere II is that there are no man-made substitutes for essential natural services.

(From Paul Hawken, "*Natural Capitalism,*" March 1997)

Initiatives from other parts of the world

In this section and other sections of the workbook, there are numerous examples of initiatives being taken in the United States and other parts of the world. At the end of this section, there are numerous examples for Round Table participants to review.

In Iceland, for instance, the government gave its blessing to DaimlerChrysler and Shell who announced plans to try to turn the tiny country into the world's first "hydrogen economy."

Iceland is moving to be world's first hydrogen economy.

The Third World holds some surprises.

What's SMUD and what does it have to do with climate change?

Check out the examples at the end of this section.

Iceland's interest in hydrogen stems not from any air pollution, but from its commitment to reduce emissions of greenhouse gases. Iceland may become a key hydrogen player in another way — exporting it to Europe's first hydrogen station in Germany, which expects to eventually buy its hydrogen supplies from Iceland.

Examples from both developed and developing countries show that many steps being taken to address climate change issues and to develop a competitive advantage. Some of the examples point to initiatives being taken by specific businesses and industries. Others point to different overall approaches and strategies being taken. Those strategies include:

- Marketing strategies, emphasizing environmentally friendly products
- Regulations and standards
- Changes to tax systems
- Business leaders taking advantage of new market opportunities
- Partnerships between environmental groups and industry.

2.7 The costs of reducing emissions

There are two broad categories of costs related to the climate change challenge:

1. Mitigation costs — the costs associated with reducing GHG emissions. With innovation and creativity, these costs can be reduced. Some suggest that costs of implementing new technologies is high and can have a negative impact on competitiveness. Others suggest that developing and implementing new technologies can be turned into opportunities by creating a competitive advantage and exporting our ability to reduce GHG emissions. And they point out that the greatest benefits often accrue to those who get in the game the earliest. Ultimately, not reducing greenhouse gas emissions may result in market costs for some enterprises.

2. Adaptation costs — the costs associated with adapting to potential changes in the climate and ecosystems. These costs are unknown, at least in part because of uncertainties and difficulty in predicting the impact of climate change.

What do you think?

The purpose of this section was to provide some background information on the issue, outline why people are concerned, and summarize some of the actions taking place in Alberta, in Canada and around the world.

Now that you have reviewed this information, what do you think?

Does something need to be done?

If you want to write the answers to these questions or send them back to us, see page 2–35.

International examples

Environmental regulation based on standards enables innovative technology solutions

Danish environmental regulation is based on setting standards to be achieved but is silent on technology choices. When new targets were established for SO_2 levels, the Asnaes Power Station in Kalundborg was able to select from among the technology alternatives available to meet the new standards. In Kalundborg, an industrial symbiosis based on by-product synergy has evolved. Asnaes was able to choose a scrubbing technology that produced gypsum with the appropriate composition and crystalinity to serve as feed stock for a wall board factory in the region. The freedom to select the best technology solution decreased the requirement for imported mineral gypsum and thereby improved the balance of payments status of the region.

Byproduct synergy demonstration projects

To demonstrate the power of byproduct synergy as a tool to approach sustainability, the Council for Environmental Cooperation (organization that administers the environmental side agreement of NAFTA) is supporting three Byproduct Synergy demonstration projects — one in Texas, one in Mexico, and one in Alberta.

Chaparral Steel, Texas — provides an outstanding example of byproduct synergy at work. Chaparral has developed a patented process for upgrading its blast furnace slag into feedstock for cement making, which increases the value of the slag by 20 times. The cement plants using the slag have increased their operating income by several millions of dollars in less than two years. This synergy has resulted in production of more cement, using less virgin limestone and resulting in an overall reduction in the CO_2 generated in the cement making process. Using the same thinking, Chaparral has developed a material recovery system for the 180 kilotons per year of automobile shredder waste that it formerly sent to landfill. This entire stream of various plastics and non-ferrous metals is now separated into pure streams of saleable products and the landfill site is being mined. The investment in recovering this waste stream was repaid within one year of operation.

Business Council for Sustainable Development, Gulf of Mexico — has built on the experience gained by Chaparral Steel in its byproduct synergy project in Tampico, Mexico. Participants in the project, which started in 1997, include 21 companies, primarily in the petroleum and petrochemical industry. The project team has evaluated 27 processes involving 373 materials. With the project not yet complete, 19 waste materials have been identified as potential feedstock for 12 companies participating in the project. In addition, 29 byproducts with 44 potential synergies with other businesses have been identified.

Alberta project — to be determined. The proposed Alberta project will assist Alberta companies to participate in an increasingly effective approach to increasing profitability and improving environmental performance by increasing the effectiveness of resource usage.

SMUD pioneers utility investment in rooftop photovoltaics and makes consumer participation easy

One of the biggest challenges for America's electric utilities is to develop ways to improve customer satisfaction while adjusting to the economic pressures of emerging competition. Business as usual is becoming a thing of the past. The Sacramento Municipal Utility District (SMUD), a customer-owned utility in Sacramento, California, has established itself as an innovator in the utility industry by deploying photovoltaic (PV) energy on residential and commercial rooftops to meet customer needs while accelerating the commercialization of this clean, renewable energy source. SMUD's PV Pioneer Program is designed to forge a partnership with its current residential customers who are willing to volunteer their roofs as sites for generating solar electricity. Through the program, SMUD will purchase enough solar panels to make 10 million watts of electricity, enough to power 3000 customers during the day. A separate program applies to public schools, local governments, and other public agencies.

SMUD had two primary reasons for investing in solar technologies:

1. To develop the experiential base needed to successfully integrate PV into the utility system
2. To accelerate the cost reductions necessary for PV applications to be cost effective by about the year 2000. To do this, they are creating a predictable, regular market for PV manufacturers, and sparking them to ramp up production and cut prices.

In addition to donating their roof space, customers are volunteering to share in the solar investment through a form of "green pricing" by paying a premium of about 15% on their monthly electric bill. **SMUD continues to get more customer demand for this service than can be accommodated in the program**. By the time the current contract expires in 2002, green pricing should be obsolete. SMUD expects the new panels to produce electricity for just 8 to 10 cents per kilowatt hour — about what its residential customers pay today. Another benefit is that the utility can add power-generating capacity to its existing grid without having to invest in a centralized power plant.

California leads the way in reducing emissions

Despite a number of conditions like high population centres, lots of business and travel activity, many older vehicles, and warm weather, California has made dramatic progress in improving air quality over the past 30 years through a variety of programs. Cleaner cars have made an enormous contribution to the clean-up. Emission standards are tighter than the EPA standards which apply elsewhere in the US. The result is that new vehicles in California are extremely clean-burning, but also have a higher price tag and may have slightly lower fuel economy. Plans were announced in 1997 to tighten those standards even further. All light trucks will have to meet the same standards as passenger cars. In 1998, those plans were approved despite protests from truck drivers. Diesel engines also have been effectively banned in cars and light trucks.

EU gives the green light to road emissions program

European Parliament deputies claim that legislation clinched in negotiations with European Union member states will impose the tightest auto exhaust requirements outside California. Projections are that the new requirements could result in a 70% reduction in exhaust pollution, compared with 1990 levels.

The Third World holds some surprises

Several "southern hemisphere" countries have been moving ahead with actions to reduce greenhouse gas emissions and, in some cases, are out in front. Examples include:

- China's energy conservation programs since 1980 have lowered the country's carbon output to half of what it would have otherwise been.
- The world's fourth-leading user of wind power is India.
- The world's largest energy efficient-lighting project is in Mexico.
- The biggest home solar photovoltaic program is in Indonesia.
- The largest renewable energy program, using sugarcane-derived ethanol in cars, is in Brazil.
- The Central American "emissions entrepreneurs" — Costa Rica, Honduras, Nicaragua, Belize and Panama — are home to 17 pilot energy and forestry "joint implementation" projects, under which countries or companies emitting excess carbon can receive partial credit for taking part in emissions-reducing projects in other nations.
- Costa Rica has established a comprehensive set of policies — phasing out fossil fuel use for electricity generation by 2010, a 15% carbon tax, and an emissions trading program to see credits on the Chicago Board of Trade for its share of carbon reductions.
- Many of these projects and policies were not designed with climate change in mind. Instead, most were designed to employ sustainable technologies and techniques to alleviate economic hardships — providing power to some of the 2 billion who lack it,

creating jobs among the 1 billion "underemployed", lessening urban health emergencies, and lowering reliance on oil imports. Some suggest the south may get a head start on some of the next century's most promising high technology industries rather than relying on old technology from industrialized countries.

- "A 1997 report by the UNDP points out that 'developing countries have the opportunity to become market leaders for various state-of-the-art and emerging sustainable energy technologies.' A study from the U.S. Pacific Northwest National Laboratory echoes this sentiment, observing that China could become a market leader in manufacturing and commercializing energy-efficiency and renewable energy technologies — just as it has with compact florescent light bulbs." (World Watch, November/December 1998)

Queen's Building, The New School of Engineering and Manufacture, De Montfort University, Leicester, UK

This building is has been called the first Gothic Revival building in the past hundred years. It was built in a manner which used traditional labour-intensive construction methods to create jobs for local workers, showed innovative new concepts, and used cleaner and greener technology. The result is a collection of smaller, domestic-scale buildings supplemented by a series of courtyards that double as outdoor classrooms so its 110,000 square feet don't seem overpowering. The Queen's building is the largest naturally ventilated building in the UK. Its narrow floor-plate allows daylight to penetrate deeply from two sides, and permits almost entirely passive air movement. Overhangs and heavy masonry walls minimize cooling loads, and building design minimizes heating and air conditioning demands. These and other strategies minimize electricity use, makes equipment smaller or even eliminates the need for it saving both energy and capital cost. Only 24% of the capital cost of the Queen's Building was for mechanical and electrical systems, compared with a typical 34 – 40%.

Technical University of Denmark

Detailed analysis at the Technical University of Denmark has shown that the present level of electricity services can be maintained while using only 26% of current electricity consumption. Examples include: better insulation on refrigerators and freezers, improved laundry soap to remove grease and stains in cold water, "smart" sensors for clothes washing, improved motors, pumps, detergents and thermal insulation for dishwashers, improve insulation, efficient motors and smarter controls for clothes dryers.

German MINERGY homes meet environmental targets

MINERGY homes are designed by Swiss engineer, Dr. Ruedi Kriesi, to meet German targets for reducing emissions of carbon dioxide. MINERGY is defined as a product that provides full functionality with an energy compatible with sustainable development. The design uses no radical new technology but is innovative in the way it integrates and uses existing ones. High insulation values for walls, floors are roofs are achieved through high

mass materials and extensive use of extruded polystyrene foam. Triple glazing gives a high value for windows. And the large mass acts as a slow heat store which buffers external temperature variations. Fresh air enters the house through pipes embedded in the soil. Space heating needs are reduced by 70%. MINERGY homes cost about 10% more. But instead of marketing the homes for ecological arguments — an argument that may not convince most potential buyers to pay a premium for the house — sales of MINERGY homes stress improved comfort. The homes are now marketed under the brand name "ComfoHOME."

Azurel building products

Dow Europe wanted to find new high-value applications for its basic insulation product, Styrofoam. The material turned out to have potential as a building material. If made more dense, and reinforced with wooden panels, it could substitute for timber or masonry walls. Code-named "Blue House" because of the insulation's distinct blue color, the project began with years of patient development and testing to meet safety and building codes. In 1987, the first prototype house was built in eastern France and eight more houses were built three years later, to permit extensive testing. Azurel's insulation quality gives it environmental advantages over both conventional timber and masonry houses. It also demonstrated economic benefits. Construction time is reduced, as are greenhouse gas emissions and the use of non-renewable resources. Total primary energy requirements represent a savings of three years of heating relative to a timber house and seven years of heating relative to a masonry structure. Additionally, the Azurel house produces six times less disposal waste than a timber house and ten times less than a masonry house. Local impacts are also reduced with an Azurel house. Since less material is used, fewer trucks are needed to transport the material. Reduced use of quarry materials results in less damage to landscapes, less noise, dust and risks. Since Azurel house components are prefabricated, building sites are safer, cleaner and quieter.

Green energy boost — United Kingdom

The UK government is to increase its spending on research into renewable forms of energy as part of its plans to tackle global warming. Research and development is to rise to 43 million pounds over the next three years, to investigate the potential of wind and solar energy and other non-polluting forms. The government has pledged to generate 10% of UK electricity renewably within a decade. The UK has set a target of reducing greenhouse gases by 12.5% by 2012 and carbon dioxide emissions, in particular, by 20% by 2010.

ING Bank's new headquarters turns environmental concerns into a business advantage

The ING (International Netherlands Group) Bank has moved from the fourth largest bank in the Netherlands to number two. They attribute a lot of the improvement to resource efficiency. The bank had a "stodgy and conservative" image and they also needed a new

headquarters. The bank's board of directors decided they wanted a headquarters that was organic, integrating art, natural materials, sunlight, green plant, energy efficiency, low noise and water. The result was a unique design. Construction costs were comparable or cheaper than other office buildings in Holland. Absenteeism dropped. The building has changed the image of the bank — it is now seen as "progressive and creative." The building is the best known in the country after Parliament House and the bank's business has grown dramatically.

CO_2 and NO_X free gas power developed by Norwegian firm

Stavanger-Aker Maritime says it has come up with a new technology which will remove all CO_2 and NO_X emissions from gas power plants. While some work remains to be settled, initial responses have been very positive. The new method uses a number of elements of known technology combined in a new way. In addition, new membrane technology which is being developed for other purposes will be ready in three to five years, and may contribute to a significant reduction in investments and operating costs.

Alberta examples

Synergistic effect of two unrelated regulatory changes

The synergistic effect of two unrelated regulatory changes in Alberta enables the application of emerging technology to significantly reduce uncontrolled combustion of gas streams. By changing the royalty structure to allow economic use of gas streams, Alberta created an incentive to find creative uses of gas. By deregulating the electricity market and creating the Alberta Power Pool, Alberta created a potential market for energy generated from gas. The technology to capitalize on this opportunity has become available within the past few years through significant advances in micro-turbine technology during the past decade. This makes distributed generation of electricity from small gas sources economically feasible.

NOVA Corporation and CU Power International Ltd.; Amoco, TransAlta, Imperial Oil, Syncrude and Canadian Utilities

NOVA and CUPIL are building a 400 MW natural gas fired co-generation power plant to supply the energy for NOVA's Joffre Petrochemical production site. Amoco, TransAlta, Imperial Oil, Syncrude and Canadian Utilities have either submitted co-generation plant proposals to the Energy and Utilities Board or are constructing these facilities. Generating facilities are expected to significantly reduce provincial greenhouse gas emissions through greater energy efficiency and by offsetting less efficient generation sources and, at the same time, increase the supply of energy-efficient electricity available to the province.

Alternative Fuel Systems finds new ways to improve car and truck performance

Alternative Fuel Systems Inc. of Calgary have developed a reverse flow converter for gas car engines that can achieve higher levels of efficiency through an innovative exhaust aftertreatment process

Alternative Fuel Systems is also a world leader in supplying advanced technology electronic fuel management systems and superior emissions control products. AFS develops leading edge hardware and software for engine fuel management systems using compressed natural gas.

The Eagle diesel fuel system brings the emissions benefits of electronic fuel injection to the natural gas diesel cycle engine market. The AFS Eagle is a unique system for converting diesel engines to operate on natural gas using a small quantity of diesel for pilot fuel. The AFS patented microprocessor optimizes the blend of natural gas and diesel under all operating conditions so that an average of up to 80% diesel replacement is achieved.

Edmonton Power

Edmonton Power has taken steps to improve the thermal efficiency of three generating stations: Genesee, Clover Bar, and Rossdale. These steps are expected to reduce CO_2 emissions by 39 kilotonnes a year.

TransAlta Utilities

TransAlta's LightSwitch program offers commercial, industrial and institutional customers a lighting energy audit and recommendations for reducing lighting costs and financing options. The program is expected to reduce new lighting costs to customers by an average of 10%.

A modified Enviro-Partners program was extended throughout the Bow Valley Corridor and launched in Drayton Valley. The program offers energy audits, analysis and retrofit recommendations to commercial and residential customers. Actions from the program contributed to an estimated 900 tonne reduction of CO_2.

Managing emissions from flaring

The Clean Air Strategic Alliance developed recommendations for improving management of emissions from the flaring of solution gas with Alberta stakeholders. The Clean Air Alliance recommended a 25% reduction in volumes being flared by the year 2001. This would result in a reduction of 1.25 megatonnes of CO_2 per year. This represents a 0.7% decrease in Alberta emissions or a 2% decrease in the emissions associated with the upstream oil and gas sector. In response, Fletcher Challenge Energy Inc. has taken a variety of actions to make effective use of solution gas from its operations. They have installed a micro-turbine that generates 25 kw power from fuel gas. They also

commissioned a further 300 kw compressor capable of using sour flare for a new turbine. The Canadian Association of Petroleum Producers is also taking steps in response. They are developing a Best Management Practices Guide for members and identifying a range of economic opportunities available for reducing flaring and ensuring environmental impacts are minimized.

Weyerhaeuser

Through participation in the Voluntary Challenge, Weyerhaeuser has substituted biomass fuels for fossil fuels, implemented energy conservation measures, and reduced the heat requirements per unit of production. Weyerhaeuser has reduced greenhouse gas emissions from 607 kilotonnes to 530 kilotonnes in the 1990-95 period.

Alberta Voluntary Challenge and Registry (VCR) winners

Nine of the fourteen winners of Canada's VCR awards in February 1999 were from Alberta:

Petro-Canada

In addition to other voluntary actions, Calgary-based PetroCan has adopted the corporate practice of encouraging their suppliers to consider getting involved in the Voluntary Challenge and Registry. Many of their suppliers, principally from the commercial sector and small to medium sized industrial companies, have been identified as desired target sectors for expansion of VCR. VCR has had a large number of calls from these PetroCan referrals who were previously unaware of the climate change issue and the need for taking action.

Encal Energy

Encal is a Calgary-based exploration and development company. Encal's detailed Action Plan included an extremely thorough baseline, detailing its primary GHG emissions sources broken down by specific gas type. Based on past experience and future emissions reduction initiatives, GHG emissions per unit of production are expected to be 36% below baseline levels by the year 2000.

Southern Alberta Institute of Technology (SAIT)

SAIT has already stablilized its net GHG emissions to 1990 levels. Despite doubling the number of full load equivalent students by 2005, SAIT predicts that current and future GHG reduction initiatives will reduce emissions to 20% below 1990 levels by 2008.

The Government of Alberta

Since the establishment of the Voluntary Challenge program, the Government of Alberta has demonstrated leadership and saved money by reducing its own greenhouse gas emissions. A target of 14.1% reduction (equivalent to 74 kilotonnes of CO_2) from 1990 levels by the year 2000 was set. By the end of 1997, that target has already been exceeded. The Alberta Government has promoted the retrofit of buildings, energy audits, and employee awareness of and personal responsibility for greenhouse gas emissions.

Energy use within the Alberta Government was reduced by 6.7% in 1997 as a result of improved maintenance and building operation and reduction in space utilized.

TransAlta Utilities

TransAlta has brought emissions to a level below 1990, with GHG emissions reduction initiatives amounting to nearly 5 megatonnes of CO_2, even through its electricity generation has increased. With continued effort, TransAlta is predicting that its GHG emissions will fall to 16% below 1990 levels by the year 2000.

Syncrude Canada

Syncrude has developed continual improvement in energy intensity, reducing the energy used to produce a barrel of crude oil by 12% between 1997 and 1998. From 1998 to 2008, predicted emissions reduction will translate into a 45% reduction in CO_2 emissions per barrel, an average improvement of 2.2% per year over two decades. Steps taken by Syncrude include:

- Increased waste heat recovery
- Reduced steam requirements
- Use of larger mining haul trucks
- Improved yield
- Energy efficient electric drive systems
- Hydrogen recovery
- Extraction improvements.

Husky Oil Operations

Husky has set a challenging target to reduce GHG emissions by approximately 670 kilotonnes per year by the year 2001. As of 1998, Husky had already accomplished about 30% of its goal.

The Canadian Association of Petroleum Producers (CAPP)

Since 1995, when VCR was still in its infancy, CAPP encouraged its members to demonstrate leadership by reporting their best efforts to reduce GHG emissions. Through their leadership, member companies representing over 93% of total GHG emissions from the upstream oil and gas sector are currently represented at VCR Inc. CAPP also published a comprehensive "Global Climate Change Voluntary Challenge Guide." This document has helped to standardize industry reporting and has aided members in recognizing effective, economically viable, GHG emissions reduction initiatives.

Hon. Anne McLellan MP

The Honourable Anne McLellan, MP for Edmonton West, was a strong advocate of sustainable development as Minister of Natural Resources Canada (NRCan). She championed the voluntary approach to reducing greenhouse gases and personally wrote to and challenged hundreds of business, institutional and government leaders across Canada to participate. Leading by example, she set the goal for NRCan to become the most energy efficient department within the federal government.

Municipal and community initiatives

City of Edmonton

The City of Edmonton became a member of the Federation of Canadian Municipalities 20% Club. Current commitments are to stabilize greenhouse gas emissions at 1990 levels by the year 2000 and a reduction by 20% below 1990 levels at some point beyond 2000. Initiatives include a facility that will co-compost municipal solid waste with sewage sludge and the establishment of a $1 million revolving energy retrofit fund. These initiatives improve energy efficiency and reduce waste. It is expected that the co-composting facility will avoid 35 kilotonnes of CO_2 equivalent emissions per year, and the retrofit will result in estimated reductions of CO_2 emissions of 2,200 tonnes per year.

City of Calgary

Calgary's City Council recently approved preparation of a Climate Change Action Plan including the following specific initiatives:

- Care for Air program that promotes and endorses a number of independent air quality improvement initiatives such as SMOG FREE and private care pooling
- A major building retrofit and energy conservation program in place in all City-owned buildings
- Upgrading the building mechanical systems in the Glenbow Museum to more efficient technologies. The result was a 70% reduction in natural gas and a 51% reduction in electricity. Annual utility costs have been reduced by $150,000.

Alberta Eco-Efficient Communities Initiative

Developed through Clean Air Strategic Alliance and managed by the Pembina Institute for Appropriate Development, this initiative helps municipalities improve the eco-efficiency of their own operations and their community as a whole. Eco-efficiency is defined as producing more of the things communities want, at less cost, with less resource use, and less waste. The initiative was produced primarily for small and medium sized communities which often do not have the in-house staff and resources for independent energy efficiency exploration. The initiative has broad based support and many information products such as "how-to" guides, internet site information, and databases of success stories have been developed and are available to municipalities.

Sustainable Communities Initiative

This initiative helps Alberta communities design and implement a plan of action to achieve sustainability. The initiative supports community efforts to become healthy and sustainable through public education, participation and communication. Projects ranging from Green Business to community inventories have been introduced in participating communities. The Sustainable Communities Initiative is a partnership between the Department of Environmental Protection, TransAlta Utilities and FEESA, an environmental education society. Seven communities are actively involved, the largest being Red Deer.

Landfill gas capture

The Alberta government, along with industry stakeholders, are examining how methane from Alberta landfills can be captured and put to economic use. EPCOR was an early leader in this area with its Cloverbar landfill gas project, developed in 1992. Alberta Environmental Protection is working with larger landfill developers to find innovative opportunities and partnerships for capturing and using landfill gas.

Buildings

University of Alberta Hospital

After reviewing all kinds of suggestions to cut energy use, the Capital Health Authority implemented technical solutions and developed a staff education program. As a result, the Capital Health Authority has reduced energy consumption at the U of A Hospital considerably. From 1991-92 to 1996-97, the hospital saved 16% on its electricity use, 12% on the amount of steam it requires, and 42% on its water and sewer output. This has resulted in more than $1 million in savings.

Hole's Greenhouses and Gardens

Hole's replaced its conventional boiler with a smarter, more energy efficient system. The new boilers are more durable, have lower maintenance requirements, and save up to $20,000 a year. And just as importantly, they provide greater temperature control and higher quality crops than before.

Mountain Equipment Co-op's Edmonton store

The Edmonton store was opened in May 1998. By converting a vacant Safeway store and incorporating numerous green initiatives, the building is a good example of the value MEC places on respecting and protecting our natural environment. A number of steps were taken, including using:

- HRC-134a refrigerant for the air conditioning system
- Computerized Building Management System to control all building systems
- high efficiency double glazing with low-emissivity coatings
- Rockwool insulation in the walls (R24) and roof (R20)
- Pressure assisted water closets, electronic urinal flushing and lavatory faucets
- High efficiency, gas fired hot water supply
- Day light sensors to control fluorescent lighting
- And a number of other features to improve energy efficiency.

Canadian provinces pilot emissions trading

In June 1998, the provinces of British Columbia, Alberta, Saskatchewan, Nova Scotia and the federal government announced the launch of a voluntary baseline and credit greenhouse has emissions trading pilot (GERT). Quebec and Manitoba now are also included. The pilot is an open market, baseline-and-credit trading system in which companies may buy and sell carbon credits among themselves as a hedge against

possible future regulation, and then register them with governments involved to receive credit for early actions. At the beginning of 1999, the GERT pilot had accepted a number of trade-matched and offer-to-sell applications from various regions of the country, including a project that reduced emissions through electricity generated by wind turbines located in southwestern Alberta.

Suncor Energy buys credits from Niagara Mohawk

U.S. based Niagara Mohawk Power completed energy improvements to one of their coal-fired stations that resulted in significantly lower CO_2 emissions. Suncor bought these emission reductions as an offset to their oilsands related emissions in Alberta. The flexibility provided by credit trading will allow organizations to pursue the most cost-effective opportunities to reduce emissions, wherever they are available.

Cold Water Extraction

Cold Water Extraction was first tested during the OSLO proposal between 1986 and 1989. More recently, Syncrude conducted a major field study pilot in 1996 using this technology. Syncrude is licensing the OSLO Cold Water Extraction process from the Government of Alberta and incorporating their own technologies such as slurry making and hydrotransport for the Low Energy Extraction Process. Using the OSLO Cold Water Extraction Process, the temperature at extraction drops from over 80°C to below 25°C. Greenhouse gas emissions related to oil sands extraction are expected to drop by 60% using this new technology. In the past year, this technology and similar derivative technologies have matured significantly and are now poised to become the oil sands extraction technology of choice for the next decade or so.

Northwestern Utilities Glycol Replacement Pump Program

Northwestern Utilities has managed to reduce a large portion of its emissions through its glycol replacement pump program. Glycol pumps are Northwestern Utilities' largest single emission source. In 2000, Northwestern will have reduced its emissions to 1990 levels — the equivalent of 138 kilotonnes less carbon dioxide emitted than if no action had been taken. At the same time, Northwestern has been expanding its pipeline and compressor facilities to meet the needs of its customers. Over the 1990 to 2000 period, emissions per unit of throughput will decrease by 35%.

Enbridge takes steps to reduce emissions

Enbridge has done extensive work on reducing the energy requirements of operating its oil pipelines by using drag reducing agents and variable frequency drives in the pumping operations. They also intend to encourage their energy suppliers to use renewable energy sources to reduce their indirect emissions. Under electricity restructuring, they will investigate purchases from suppliers offering electrical power produced by cogeneration and renewable energy.

TransCanada Pipelines Ltd. achieves success

TransCanada Pipelines has achieved several successes in implementation of both direct and indirect mitigation efforts, including:

- A reduction of 547 kilotonnes of CO_2 equivalent through its 1997 blowdown mitigation strategy
- Field implementation of a comprehensive fugitive emissions program that resulted in a 21 kilotonne CO_2 equivalent reduction
- Reduction of 41 kilotonnes of CO_2 equivalent through the use of Clock Spring technology developed by the Gas Research Institute
- Completion of an extensive education and awareness program for employees and neighbouring communities.

Luscar Coal investments reduce energy consumption

Luscar's capital investments are having a significant impact on reducing the company's energy consumption. Luscar purchased a 40 cubic yard mining shovel at the Luscar Mine, replacing two existing 15 cubic yard shovels, translating into a 33% productivity improvement while using 48% less energy. Luscar has also purchased 240 ton haul trucks to replace 170 ton trucks, translating into a 15% improvement in efficiency.

Fording Coal uses Global Positioning System to improve energy efficiency

Fording Coal has installed a Global Positioning System-based mine dispatch at its Greenhills mine. This system uses satellites for efficient allocation of mining resources through real-time tracking and dispatching of mobile mining equipment. The use of this system provides significant productivity gains which in turn have reduced energy inputs per unit of coal produced.

Steam Assisted Gravity Drainage

Steam Assisted Gravity Drainage is a method of producing bitumen which uses less steam and achieves greater recovery than any other thermal recovery process. The technology was proven at Alberta's Underground Test Facility using well pairs drilled from the surface and from underground. Expectations are that most of the future in-situ bitumen production will be based on this technology. It allows production of bitumen which was previously inaccessible, either too deep for surface mining or too shallow for high pressure steam stimulation.

Examples of strategies

Green-e labeling on electricity products

As the market opens up for choice in where customers buy their electricity, consumers may be interested in knowing whether their electricity comes from a source that is good for the environment. As a result, a group of American environmentalists, consumer advocates, industry participants, and the Center for Resource Solutions, have established a *Green-e* Renewable Electricity Project in order to encourage consumer confidence in buying "green" electricity. The *Green-e* logo is a way for customers to easily identify "green" electricity products. Products with a *Green-e* logo must meet the following criteria:

- At least 50% of the electricity supply for the product comes from renewable electricity sources
- Any non-renewable part of the product has lower air emissions than the traditional mix of electricity
- The company offering the product agrees to abide by the *Green-e* Program's code of conduct, which requires providers to disclose sources of electricity.

Marketing approaches and incentives achieve results

Several companies are using different approaches to rebates and incentives to encourage marketing of environmentally sensitive alternatives. The Pacific Gas and Electric Company found that, rather than paying 1.9 cents to save a kilowatt hour by rebating buyers of energy-efficient refrigerators, it could achieve bigger savings at a cost of only 0.6 cents per kilowatt hour by giving a cash bonus of $50 to the retailer who sells an efficient refrigerator but nothing to the retailer for selling an inefficient one.

Southern California Edison Company realized that its retail rebates would yield larger savings if it moved upstream to the manufacturer. Instead of giving a $5 rebate for buying a compact fluorescent lamp in a retail shop (reducing the cost from $19 to $14), if it gave the $5 rebate to the manufacturer, it could reduce the manufacturing cost from $9 to $4, and the retail price would be only $9. This caused far more lamps to be bought and resulted in the retail price dropping even further to $5.50.

British Columbia Hydro took steps to transform the market for premium-efficiency industrial motors starting in 1988. Prior to that, premium-efficiency motors were not stocked; they required a special order and long waiting times. In three years, B.C. Hydro raised the market share of premium-efficiency motors from 3% to 60% by offering rebates so generous that no one could afford to ignore them. Now the market has been completely reversed — the standard-efficiency motors have to be specially ordered while the premium-efficiency motors are in stock.

Sweden uses competitive approaches to stimulate innovation

In 1989, the Swedish National Board for Industrial and Technical Development (Nutek) introduced a strategy to promote the introduction of more environmentally efficient refrigerators. Nutek decided to organize a competition open to all foreign and domestic manufacturers to design a super-efficient fridge. Standards were set for energy efficiency, environmental compatibility, and consumer information. The winning model was designed by Electrolux. While the winner was originally guaranteed the sale of 500 units, the publicity from the competition meant that Electrolux received orders of more than 10,000 units.

Market growth increases demand for solar power

Though still small by energy industry standards, the solar market has recently grown at 10 times the rate of world oil production. If annual production were to grow at 25% per year to 2020, solar capacity would reach 106,000 megawatts, generating as much power as 30 to 40 large nuclear plants. Companies are seeing the market potential of solar energy. Several major companies, such as Canon, Honda and Siemens, have invested in solar power. U.S. energy firms Enron and Amoco have teamed up to triple their investment in their jointly owned Solarex Company and their solar cell plant in Maryland.

Regulations and standards play a role

Michael Porter, professor at the Harvard Business School, argues that strict environmental regulations do not inevitably hinder competitive advantage — they can enhance it and trigger innovation. He cites 3M as an example. 3M estimates that its "Pollution Prevention Pays" program has saved $482 million since 1975, while eliminating more than 500 kilotons of waste and pollutants, and has saved another $650 million by conserving energy. "Properly constructed regulatory standards which aim at outcomes and not methods, with encourage companies to re-engineer their technology. The result in many cases is a process that not only pollutes less but lowers costs and improves quality." (Scientific American, April 1991) He suggests that the right kind of regulation should stress pollution prevention rather than abatement or cleanup, not constrain the technology, and be sensitive to costs involved. The right kinds of regulations are needed to:

- Create pressures to motivate companies to innovate
- Improve environmental quality in cases where innovation and improvements in resource productivity do not completely offset the cost of compliance
- To alert and educate companies about resource inefficiencies and potential areas for technological improvement
- To raise the likelihood that product and process innovations will be environmentally friendly
- To create a demand for environmental improvements
- To level the playing field and ensure that one company cannot gain position by avoiding environmental regulations.

Model National Energy Codes set standards for buildings and houses

The Model National Energy Code for Buildings and Houses establishes minimum standards for construction of building components and features that affect a building's or a house's energy efficiency. The Codes are a model upon which energy-conscious building designers, developers and contractors across Canada can base cost-effective, energy-efficient building designs. Energy efficient buildings make economic as well as environmental sense. These buildings cost less to operate, are more comfortable, with better indoor air quality and reduced noise and dust infiltration, offer more opportunities to use innovative new products and techniques, and create market opportunities for new products and technologies.

Some countries use tax systems to encourage reductions in emissions

Six countries in Europe — Denmark, Finland, the Netherlands, Sweden, Spain and the United Kingdom — began restructuring their taxes during the 1990s. The process, known as "tax shifting", reduces income taxes while offsetting these cuts with higher taxes on environmentally destructive activities such as fossil fuel burning, generation of garbage, use of pesticides, and production of toxic wastes. The reduction in taxes does not exceed 3% in any of the countries. Public opinion polls show that 70% of the public support the tax shifting.

In mid 1998, the government of Germany announced a massive restructuring of the tax system to simultaneously reduce taxes on wages and raise taxes on CO_2 emissions. The government argued that these tax changes would help strengthen the German economy by creating additional jobs and at the same time reducing air pollution, oil imports, and the rise in atmospheric CO_2.

In Japan, the Tokyo metropolitan government plans to cut the automobile tax for low-pollution cars by as much as 50% while increasing the tax by 10% for automobiles that were first registered more than 10 years ago.

Business leaders see new market opportunities

Increasingly, business leaders are looking at a shift from the old industrial model to a new environmentally sustainable model of economic progress and development.

In 1997, British Petroleum announced a $1 billion investment in the development of wind and solar energy. CEO John Browne said that, "The time to consider the policy dimensions of climate change is not when the link between greenhouse gases and climate change is conclusively proven, but when the possibility cannot be discounted and is taken seriously by the society in which we are a part. We in BP have reached that point." (World Watch, March/April 1999)

Royal Dutch Shell has committed $500 million to development of renewable energy sources. Ken Lay, head of Enron, a large Texas-based gas supplier with annual sales of $20 million, sees his company playing a central role in the conversion from a fossil-fuel

based energy economy to a solar/hydrogen energy economy. Also in the U.S., Ray Anderson, the head of Interface, a leading carpet manufacturing company, is starting to shift his company from the sale of carpets to the sale of carpeting services. Instead of buying the carpet, Interface's customers get carpet service for ten years, including installation, cleaning, repairs and maintenance for 10 years. At the end of 10 years, Interface can replace the carpet and ensure that 100% of the old carpet is recycled to make new carpets.

In Canada, MacMillan Bloedel, under the leadership of Tom Stevens, has given up the practice of clear cutting. Clear cutting will be replaced by selective cutting, leaving trees to check runoff and soil erosion, provide wildlife habitat and help regenerate the forest.

Environmentalists team up with industry

The World Resources Institute (WRI), an environmental organization based in Washington, D.C., recently entered into a partnership — the "Safe Climate, Sound Business" initiative — with the oil and gas company BP Amoco, automaker General Motors, and the agriculture and biotechnology company, Monsanto. All four organizations started with a set of policy recommendations for businesses and governments and now are implementing the business recommendations internally, starting with the measurement of their emissions of greenhouse gases.

The purpose of this section was to provide some background information on the issue, outline why people are concerned, and summarize some of the actions taking place in Alberta, in Canada and around the world.

Now that you have reviewed this information, what do you think?

Does something need to be done?

Notes

3. Framework for action

Your roadmap to section 3

Assessing the risks and opportunities

This section outlines some of the key issues and risks Alberta may face in future as a result of climate change. It asks important questions about how people view those risks and how Alberta should respond. It takes us one step further in reaching agreement on whether:

Something needs to be done

Something can be done . . . and we're prepared to do it.

3.1 The challenges of climate change

The previous section of this workbook provided some background information on the various issues involved in climate change and reducing greenhouse gas emissions.

That information brings to light some important challenges.

- **The uncertainty factor**

We know some facts about greenhouse gas emissions and the potential impact of greenhouse gases on climate change. We know, for example, that GHG emissions are rising as a result of human activity. Atmospheric concentrations of GHGs are increasing, long-wave radiation is being trapped in the atmosphere, and global mean surface temperatures are increasing. What is less certain is the link between GHG levels and global climate. Scientists disagree on whether or not increasing emissions of greenhouse gases are, in fact, causing an impact on the world's climate. There is uncertainty about the effect global climate change will have on our world. No one knows for certain what absolute level of greenhouse gas atmospheric concentrations would be tolerable or what levels would likely not affect long-term global temperature averages.

- **The cost factor**

At this point, it is difficult to estimate the costs of taking significant steps to reduce greenhouse gas emissions. There is a risk that some sectors may pay a higher price while others benefit. In addition, steps taken now to reduce greenhouse gas emissions may have a price and the returns on those investments may not be seen until much further in the future.

- **The global factor**

Climate change is a global issue but it is an issue that could have a direct impact on Alberta's economy and lifestyle.

In the past, emissions of carbon dioxide have not been regulated at a local or regional level because it was generally believed that

CO_2 had no direct effects on local or regional human or environmental health. That view has changed. Now it is thought that, regardless of where the greenhouse gases are emitted, their cumulative effects could lead to global warming, which would cause adverse impacts on the whole world.

While the response to climate change has been initiated at the international level, actions will need to be taken at the local and regional level and will have local and regional economic and social repercussions.

- **The time factor**

Climate change is also a long-term issue. Like many other environmental issues, the benefits of taking action on climate change will largely occur in a future period that is beyond the ordinary planning horizons of most public and private sector decision makers. Action taken today may not necessarily have immediate climate change-related paybacks. However, whatever action is taken today will inevitably have short-term economic and social consequences.

In the past, individuals, corporations, institutions and governments have taken steps to avoid or mitigate adverse environmental effects within a relatively well-known context. The geographical extent of potential impacts is often reasonably well delineated, for example, and the responsible parties can be identified more easily.

It has also been possible, by and large, to identify alternatives and to assess environmental and economic consequences. Decision makers — whether personal, corporate, institutional or governmental — have been able to calculate their own costs and benefits of taking action, and to decide whether the benefits outweigh the costs in each particular case.

Responding to the climate change challenge is different. Some may see the benefits of taking action as somewhat remote. On the other hand, actions must be taken locally, and the costs of doing so are fairly immediate. How, then, do decision makers individually and collectively determine whether the benefits outweigh the costs?

To the extent that actions to reduce GHG emissions focus on energy production and the use of natural resources, they will be fundamentally linked to Alberta's economic development. Significant reductions in GHG emissions could ultimately affect our standard of living if the actions are not well thought out. The challenge is to respond to climate change within a framework which makes taking action cost-effective and justifiable both individually and collectively, in comparison to what other individuals, corporations, institutions and governments are doing around the world.

- **The political factor**

As noted in the previous section, the UN Framework Convention on Climate Change has been signed by many countries, including Canada. At the same time, there is uncertainty about the specific measures that will be agreed to in the final analysis and the impact those could have on Canada and Alberta. What if legal sanctions to reduce greenhouse gas emissions were imposed upon Albertans? The consequences could be severe, especially if those obligations were imposed solely on energy producers such as if some greenhouse gas reductions were achieved in the short term by cutting back on production. Fuel substitution on a massive scale could leave other producers without a market. Economic restructuring could result, which could have an impact on many Albertans' jobs.

- **The competitive factor**

In recent years, many individuals, businesses, and governments around the world have adopted sustainable development as an operating principle. They have positioned themselves to respond to society's changing expectations and preferences by focusing more and more on the wise use of natural resources. The benefits of doing so have varied, but experience has demonstrated often enough that costs may be reduced overall with a consequent increase in productivity or disposable income. As noted in the previous section, some suggest that businesses and industries that fail to take action on developing their own environmental solutions may risk losing a competitive advantage in the marketplace.

3.2 Assessing the risks

It is prudent to evaluate the risks presented by any challenge before devising a strategy and action plan in response. It's a similar situation to individuals deciding whether to buy or not to buy an insurance policy. Individuals take precautions based on their view of possible adverse affects on the well being of their families, their property or their livelihood. Responding to the risk of climate change is no different.

What are the risks?

What are the risks? The information in the previous section and the challenges noted above, point to a number of different perceptions and interpretations about what the risks might be. *Various people have pointed to one — or more — of the following as being likely:*

1. **Global warming occurs and causes significant environmental and economic consequences. Attempts to adapt to these changes require considerable effort and expense and achieve varying success.**

2. **International obligations or restrictions are imposed, affecting Alberta's economy and ability to take independent action.**

3. **Early development and implementation of new technologies or approaches elsewhere provides others with increased profits and competitive advantages over Alberta.**

4. **New technologies combined with lifestyle, cultural or regulatory changes reduce Alberta's traditional markets while providing new but different opportunities.**

5. **The costs of reducing greenhouse gas emissions or of adapting to climate change are shared inequitably among sectors of the economy or society (e.g. someone pays while others benefit, costs are borne today while benefits are only realized much later).**

6. **The costs of reducing greenhouse gas emissions or of adapting to climate change are too great for a given sector to bear.**

7. **Global warming, international responses (through protocols or actions) and their economic or social effects will not occur to any appreciable degree, if at all. Efforts and resources used to reduce greenhouse gas emissions are mistakenly applied. Those who take actions to reduce greenhouse gas emissions simply reduce their competitive position.**

Think about these questions . . .

Which of these risks seem most reasonable to you?

Are there other risks?

How can you best deal with those risks?

How should Alberta best deal with those risks?

If you want to write the answers to these questions or send them back to us, see page 3–7.

3.3 Responding to the risks

Albertans, along with leaders in business, industry, governments and institutions, have choices we can make about how to respond to the risks. Think about these alternatives. We could decide that:

How should we respond?

1. **The science is inconsistent and the costs of adapting to climate change — if any — will be low. Alberta will retain its markets and will be able to continue to compete successfully without any special efforts or programs. International protocols or changes can be dealt with adequately through normal practices and, therefore, Alberta should focus on other priorities.**

2. **The overall risks — environmental, competitive and political — warrant precautionary measures beginning immediately, even if some of those measures involve incurring prudent costs.**

3. **The risks and consequences of climate change and of related economic and political actions are high and warrant significant measures now. These may include substantial costs at least in the short term.**

4. **There may be sufficient reasons to respond on climate change, possibly with concerted efforts, but the situation is not clear enough yet. There will be enough time to respond, so we should wait and see.**

5. **The various risks are sufficient to warrant immediate action, which could range from prudent to substantial depending on the particular situation. It will be very important to set good priorities.**

Think about these questions . . .

Which response makes the most sense to you?

How should Alberta — individuals, business and industry, institutions and governments — deal with the risks?

The Government of Alberta feels that the potential impacts and costs of all types are sufficient to warrant prudent action without delay. That position is outlined in the Climate Change Strategy.

What do you think? Would you change the response in any way? If so, how?

If you want to write the answers to these questions or send them back to us, see page 3–7.

3.4 Determining the criteria for success

Albertans have independently built prosperity over the years by introducing innovative responses to international challenges and opportunities. Albertans now have an opportunity to take a leadership role in demonstrating that the wise use of resources creates an Environmental Energy Advantage. Certainly, trends around the world point to a convergence of economic and environmental interests. We could capitalize on this trend to enhance and sustain the Alberta Advantage.

How will we judge the success of our actions?

In taking action, however, we should be clear about the fundamental objectives of Alberta's response. How will we judge the success of our actions? What are the fundamental objectives we are trying to achieve? What will make a good, acceptable solution?

An example of a criterion for success might be the following:

Alberta will make every effort to use resources wisely, thereby protecting the environment and increasing prosperity, while also doing our fair share to reduce greenhouse gas emissions.

We need to consider and set the criteria for success before we launch into action plans.

Think about these questions . . .

What are the fundamental objectives we are trying to achieve?

What are the criteria for success?

If you want to write the answers to these questions or send them back to us, see page 3–7.

Which of these risks seem most reasonable to you?

Are there other risks?

How can you best deal with those risks?

How should Alberta best deal with those risks?

Which response makes the most sense to you?

How should Alberta — individuals, business and industry, institutions and governments — deal with the risks?

The Government of Alberta feels that the potential impacts and costs of all types are sufficient to warrant prudent action without delay. That position is outlined in the Climate Change Strategy.

What do you think? Would you change the response in any way? If so, how?

What are the fundamental objectives we are trying to achieve?

What are the criteria for success?

Notes

4. What needs to be done?

Your roadmap to section 4

Taking action

In this section, we move from deciding whether something can and should be done, to focus on specific actions that could be taken, sector by sector, in Alberta. The key questions to be addressed in this section are:

What actions can and should be taken?

How should those actions be accomplished? Who is responsible?

4.1 Everyone can participate

All Albertans can play a role in responding to the climate change challenge. Everyone can do something, although the response will be different for different groups, for different organizations, and for different sectors.

In many instances, a successful response will require that a series of related actions by individuals, businesses and governments must be implemented. Recent reports suggest that between 40 and 50 million consumers in the United States — about 25% of the adult population — are starting to integrate environmental and social values into purchasing and investing decisions. (World Watch, November/ December 1998) Steps like ecological labeling on consumer products, government procurement policies and marketing based on environmental responsibility are increasing awareness and shifting priorities for consumers in several industries.

4.2 Focusing on six sectors in Alberta

The objective of the Round Table is to begin building a made-in-Alberta action plan. In this section of the workbook, six sectors are presented for discussion purposes:

- **Agriculture and food production**
- **Buildings (residential, commercial, and institutional)**
- **Energy (coal, oil and gas, electricity and pipelines)**
- **Forestry and forest products**
- **Manufacturing and processing**
- **Transportation (personal, commercial and institutional)**

In each sector, a number of opportunities for reducing greenhouse gas emissions are described. These opportunities are by no means the best or the only opportunities. They are offered

as a starting point for your discussion and input. Participants are also encouraged to look back at some of the examples included in earlier sections of the workbook.

For each of the six sectors, four key questions are posed:

- **Who can contribute to reducing greenhouse gas emissions in this sector?**
- **What actions can be taken by this sector?**
- **What, if any, barriers need to be removed or incentives given to facilitate the action?**
- **What, if any, coordinating function is required to optimize activities in those sectors?**

In relation to the second question — what actions can be taken — we also ask whether the action falls into one or more categories — technology/research and development, market mechanisms, policy, education, or alliances. These categories are intended to help capture everyone's ideas and to put them in a useful framework for discussion.

Some actions will fall into two or more categories. Technology, for example, frequently plays a central role in suggested responses to the climate change challenge. But technology alone is not action. Innovation and information, personal and professional choices, opportunity and feasibility all play a role in determining whether action will be taken, and how successful the action will be.

Sector 1 — Agriculture

As noted earlier in this workbook, the agriculture sector accounts for 14% of Alberta's greenhouse gas emissions (Figure 9). Very little of the GHG emissions from agriculture are of CO_2. The dominant greenhouse gases from agriculture are nitrous oxide from fertilizer use and methane from livestock operations.

The only agricultural source which has reduced greenhouse gas emissions from 1990 to 1995 is CO_2 emissions from soils. CO_2 emissions have decreased from 5.1 Mt to 1.7 Mt between 1991 and 1996 due primarily to increased adoption of no-tillage and reduced summer fallow practices, which has increased soil organic matter.

One of the more promising opportunities for reducing emissions in the agricultural sector is the continued reduction of CO_2 and possible N_2O emissions through the more widespread adoption of reduced or no-tillage crop management practices. These farm practices preserve the soil and have been shown to reduce the decomposition of soil carbon to CO_2. Most farms in Canada use less tillage than a generation ago. No-tillage practices have been adopted in about 14% of cropland in 1996 and the rate of adoption is increasing.

Opportunities for reducing greenhouse gas emissions come from a number of strategies including:

- **Soil carbon storage (reduced tillage)**

The adoption of farming practices, including reduced tillage, more forages and less summer fallow, leads to increased soil organic matter (carbon storage) and less fossil fuel use, which contribute to reduced GHG emissions. The technology opportunities include new equipment (seeders, fertilizer applicators, sprayers) designed to operate under different conditions, and changes in farming practices needed when tillage is reduced or eliminated.

Depending on estimates of the rate of adoption of new farming practices and on the rate of carbon storage in soil, the agricultural soil "sink" is estimated to be a significant fraction of the agricultural industry's GHG emissions.

- **Fertilizer management**

Nitrous oxide is a potent greenhouse gas that has 310 times the greenhouse warming potential of carbon dioxide per unit.

New and emerging technologies in slow release fertilizer formulations and precision application hold promise to increase nitrogen use efficiency and reduce nitrous oxide emissions. Agriculture is in the forefront in adopting and implementing new technology that helps improve economic efficiency, international competitiveness and also has environmental benefits. Alberta agricultural research scientists are among the forefront of the national effort to better understand the processes governing nitrous oxide emissions from agricultural systems and how to reduce them.

While estimates are that nitrous oxide makes up about 40% of Canada's national GHG emissions inventory, there is considerable uncertainty about this estimate. The difficulty is apparent when we consider that we may achieve a 20 or 25% reduction in nitrous oxide emissions, but not have confidence that we can measure the change.

Nitrous oxide is a difficult gas to measure, in part because it exists at very low concentrations, and the release varies tremendously over space and time. Preliminary research indicates that the bulk of annual nitrous oxide emission may occur in a few days during the spring thaw and in a few days following heavy rain events.

There is also no good data upon which to estimate the potential for GHG reductions from these technologies, but a plausible, modest estimate is in the range of 20 to 30%.

- **Livestock feeding and manure management**

Cattle are ruminant animals, which means they can eat feed that others cannot digest. The rumen is like a stomach, contains microorganisms that break down the feed into components the

animal can absorb and use. The process naturally occurs anaerobically (without oxygen) and produces methane as an end product. Methane is also a potent GHG with about 21 times the warming potential of carbon dioxide.

Research into improved livestock feeding practices and manipulation of the organisms in the rumen has the potential to reduce methane emissions by about 10%.

Manure storage creates anaerobic conditions that also produce methane. Research into alternate manure storage and handling technologies has potential to reduce or, in some cases, eliminate methane. One technology opportunity is to capture methane from manure storage and use it to generate electricity. New intensive livestock operations, that have little or no capital investment, may be well positioned, with suitable incentives, to implement leading edge technology with minimal GHG emissions.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the agriculture sector?

2. What actions can be taken in the agriculture sector?

Agriculture	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

If you want to write the answers to these questions or send them back to us, see page 4–25.

Sector 2 — Buildings

The buildings sector is large and diverse and includes commercial, residential, institutional and government buildings. The sector includes upwards of 11 million buildings in Alberta.

Opportunities for reducing greenhouse gas emissions come from a number of different approaches.

- **Adopting more energy efficient technology**

Reducing greenhouse gas emissions from commercial and institutional buildings requires stakeholders and service providers to change behaviours and adopt more energy efficient technologies. Many examples of new technologies exist and some are described in this section and earlier sections of the workbook. Currently, the market for energy efficient technology is quite fragmented. It includes many potential technologies, numerous suppliers, different distribution channels, different sizes and types of buildings operating at different levels of efficiency, and millions of constituents and service providers influencing purchasing decisions. Measures are needed to raise the general awareness and change attitudes in order to increase the adoption of more energy efficient technologies. These measures could include awareness programs, public education and outreach, and labeling. Many programs currently are in place that use these measures and could be very effective if used in combination with government regulations such as market and economic instruments, codes and product standards.

- **The human factor**

The human factor — decisions made by individuals whether it's building owners, design and construction companies, or people who use the building — is a critical factor in achieving energy efficiency and reducing greenhouse gas emissions. Opportunities to improve energy efficiency exist throughout the life of a building from design, construction, retrofit and ongoing operation. Decision makers can choose to implement energy efficiency improvements during design, new construction, renovation and retrofit, and ongoing building operation. Users of buildings can improve energy efficiency through taking steps to turn systems off when they are not required and reduce power requirements when less power is sufficient. How occupants operate and maintain the building and its equipment, the level of service expected by building occupants, and the purchasing decisions they make are all very important factors influencing energy consumption.

- **Regulations, standards and codes**

Examples in this section and earlier in the workbook point to cases where regulations and standards have been used to promote and encourage the use of energy efficient alternatives in design and construction of buildings.

- **Government-owned and institutional buildings**

Provincial, municipal and local governments own and operate numerous buildings. The Province of Alberta, the City of Edmonton and the City of Calgary have taken significant steps to address climate change. Some examples of those steps are included in the workbook. In addition, a number of buildings are owned and operated by health authorities, schools and post-secondary institutions. These organizations also have an important role to play in improving energy efficiency in their buildings.

- **Modernizing office structures**

Alberta's office and commercial infrastructure consumes significant energy resources. Building operators and managers evaluate this consumption and continually look at ways to conserve energy and reduce expenditures. Either during the design and planning stage or as a building retrofit, modernization of energy consumption systems can have multiple benefits. Updated HVAC and lighting which use computerized controls that integrate SCADA can offer a beneficial internal environment for occupants, save energy and money and reduce GHG emissions.

- **Residential buildings**

Residential buildings are the most complex, long-lasting consumer products in the marketplace. A single house may have up to 1,600 different products, covering over 60 basic commodities including lumber, steel, plastic and so on.

Some products, like carpets, can be replaced a dozen times over the lifetime of the structure and may also require periodic maintenance. Other products last the full lifetime of the building. A clear method is needed to account for the flows of energy and materials and the associated greenhouse gas emissions at every stage in the life cycle of a house.

Examples in this section and in earlier sections of the workbook point to steps currently being taken in the buildings sector to improve energy efficiency and reduce greenhouse gas emissions.

Examples

Housing construction

While housing design and construction have become increasingly energy efficient and a wide variety of new materials and construction methods are used, there is potential for further innovation. A straw-bale and rammed earth construction method is being tested in demonstration structures for residential and agricultural purposes in Canada and the United States. In High River, Alberta, a residential straw-bale house has been constructed and been toured by delegations from as far away as Hungary. This method has multiple environmental advantages including contributing to energy efficiency and greenhouse gas reductions such as eliminating approximately 75% of the wood used and employing an inexpensive and readily available building material. The technology, once developed, can be exported to a wide variety of markets.

Straw bale homes — Sherwood Park

Gordon Gericke of Sherwood Park is building a 2100 square foot home and 900 foot square garage out of straw bales that will be covered in stucco. The home will have an insulation value of between R-45 and R-50 compared to the R-12 to R-20 value of traditional new homes. The house will cost about $45 per square foot to construct compared with a modest entry house cost of $75 to $80 per square foot. Moisture and fire pose no greater problems than conventional wood frame houses.

The Alberta Sustainable Home

The Alberta Sustainable Home was built in partnership with various individuals and companies. The design of the house is based on occupant health, environmental responsibility, energy efficiency, and affordability. The home is located in Calgary. Compared to a conventional house of the same size, the environmental impact of this house includes:

- total utility savings of $1300 per year
- 100% reduction in natural gas
- 175 GJ savings of $500 for space and water heating
- 10,000 KWH per year reduction in electricity
- 18,500 KG of greenhouse gas emissions avoided per year
- 238,200 litres of drinking water saved per year
- 97,000 litres of sewage treatment avoided per year.

Canadian Utilities

By changing the light fixtures in their 18 story corporate office building, Canadian Utilities was able to cut their lighting bill by about 30% and improve the quality of light and comfort of employees. This was done simply by changing traditional 40 Watt T12 fluorescent tubes with new 32 watt T8 tubes and replacing conventional magnetic ballasts with more modern electronic ballasts. Canadian Utilities expects to recover their lighting retrofit investment in less than five years.

Freedom Ford

This Edmonton car dealer saves $1,800 per month by taking energy efficiency actions identified by EPCOR and financed by EnVest Alberta. The energy efficiency audit undertaken on Freedom Ford's buildings indicated that the money necessary to change the fluorescent light fixtures to high efficiency fluorescent fixtures with reflectors and electronic ballasts would be earned back in sixteen to eighteen months.

Destination Conservation in schools

Destination Conservation is a project of the Tomorrow Foundation, an independent Canadian non-profit organization dedicated to environmental education and the creation of an environmentally sustainable future.

Since the program was launched in 1986, Destination Conservation has involved hundreds of Alberta schools in programs to save energy, save water and reduce waste. This program has saved participating schools over three quarters of a million dollars through reduced utility costs. The 11 million kilowatts of energy, 194 gigajoules of natural gas, and 39 thousand cubic metres of water saved by these schools translate into a reduction of over 22 kilotonnes of carbon dioxide emissions. As part of this initiative, energy service contractors and Alberta energy companies have established a program that enables school boards to make up to $20 million in energy efficiency retrofits. The energy service contractors make the capital investments, the capital is repaid to them through the school board's savings on their energy bills, and the energy service companies' financing costs are paid by the participating energy companies. In exchange, the energy companies earn credits for verifiable emission reductions. TransAlta and Suncor are two of the early companies involved.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the buildings sector?

2. What actions can be taken in the buildings sector?

Buildings	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

If you want to write the answers to these questions or send them back to us, see page 4–25.

Sector 3 — The energy sector

The energy sector has been a leader in taking voluntary action to reduce greenhouse gas emissions. Overall, the sector has reduced 11 megatonnes of carbon dioxide equivalent emissions since 1990. This leadership has occurred through the activities of innovative and forward looking Alberta companies and energy associations. There is an opportunity to translate these experiences into broad-based action in the energy sector.

Strategies the energy sector can consider to reduce greenhouse gas emissions fall into two broad categories — those that relate to exports of their products to markets outside Alberta and Canada, and those that relate to their own production. A key issue facing the energy sector is the large proportion of their products which is exported for use outside of Alberta. The impact of increasing demands from end-use sectors and consumers outside the province affects both production levels and emissions. While producers are expected to decrease levels of greenhouse gas emissions, consumers can also contribute by taking action to reduce greenhouse gas emissions within their own sphere of operation.

- **Emissions associated with exports**

Alberta plays a key role in providing primary energy to North American and other world markets. This energy helps others achieve their economic goals and supports their standard of living. In the case of natural gas, it also helps others achieve sustained long-term emission reductions when used as a fuel substitute for coal or oil. One study, for example, estimated that US greenhouse gas emissions would be increased by between 25 and 40 megatonnes per year (for 1995 and 1996), if American electric utilities did not have access to Canadian natural gas as a substitute fuel for their generators.

Offsets

In some cases, it will be difficult for specific energy-related companies to significantly reduce their own growth in emissions. These companies may have either adopted best management practices or have high levels of projected growth due to high consumer demand. One opportunity for such industries will be to partner with other stakeholders to offset emissions either provincially, nationally or globally. Some Alberta organizations are already becoming involved in these activities as a way to manage the risks associated with their current growth in greenhouse gas emissions. Identifying the most promising offset opportunities will require innovation and collaboration among a broad range of stakeholders. Demonstrating the local benefits of this approach will be important for the public to understand and support such initiatives.

- **Reducing emissions at the production stage**

Advancing the application of new technologies to reduce emissions
Many organizations are actively investigating how we can continue to improve the efficiency of energy development through technological innovations. Ongoing technological innovation will help to enhance Alberta's Environmental Energy Advantage — with the dual benefits of reducing environmental impacts associated with energy production while improving the competitiveness of Alberta energy producers and those companies exporting our technologies around the world. A group of industry, government and university stakeholders recently concluded a series of meetings to discuss a climate change technology strategy. While their paper will not be released until shortly after the Round Table, many of their ideas have been incorporated into the workbook.

Best practices
Leading edge organizations can share their best management practices with others in the sector. Many of these best practices are linked to technology innovations. Adopting these new technologies can result in efficiency improvements. Energy organizations can help to promote these developments with their members.

Co-generation
The world-wide trend towards restructuring electricity markets is providing the opportunity for a range of low-emission electricity sources to compete with traditional electricity sources and find a market. In Alberta, electricity structuring has already provided the province with an opportunity to reduce the greenhouse gas intensity of its electricity production. We are seeing a trend towards co-generation projects which use waste heat to power electricity turbines. In fact, over the past year, there have been several projects either completed or announced that will provide power to new industrial facilities and sell excess power to the Alberta grid.

Examples

Greenpower purchases in Alberta

Electricity consumers in Calgary may now choose to support emission friendly power generation. Deregulating the electricity sector in Alberta has been an important catalyst for market-driven greenpower projects, in particular wind energy. Vision Quest Wind Electric and ENMAX have partnered to offer "green energy" to customers in the province. Two new wind turbines have been installed in southern Alberta and more are planned.

Enhanced oil recovery through CO_2 injection — PanCanadian's Weyburn project

PanCanadian Petroleum and its partners are progressing with an Enhanced Oil Recovery project at Weyburn, Saskatchewan that will inject presently vented CO_2 into a reservoir in order to increase crude oil production by at least 122 million barrels. Approximately 18 megatonnes of CO_2 will be captured, compressed and pipelined to the Weyburn field from Dakota Gasification Company's coal gasification facility in Beulah, North Dakota. The net reduction in emissions to the atmosphere as a result of the project will be in the order of 14 megatonnes of CO_2. This high technology method of enhancing oil recovery, with an appropriate oil royalty regime, provides a commercial use for CO_2, avoiding its release to the atmosphere. The technology can be applied in other reservoirs in Alberta and Saskatchewan. The crude oil produced is a result of the reduction of emissions rather than the release of emissions during production.

Alberta Research Council R&D — coal-bed methane recovery

The Alberta Research Council established a consortium with a number of private and public sector partners, including Alberta Energy, TransAlta Utilities and EPCOR, to undertake a "proof-of-concept" R&D project on a closed-cycle approach to CO_2 disposal from natural gas-fired power plants. Conceptually, the process could lead to a "near zero" greenhouse gas emissions facility using fossil fuels. CO_2 would be captured from a power station, injected into a deep coal seam containing natural gas, and stay captured in the deep coal seam. Methane would be recovered and used to help fuel the generating station. Results have been sufficiently promising to proceed to a small-scale pilot project, in order to advance and optimize the technology.

NOVA/TransCanada Pipelines blowdown mitigation strategy

Nova Gas Transmission Ltd. has used a number of techniques to reduce greenhouse gas emissions produced by blowdowns. Blowdowns occur when methane is vented to the atmosphere through the construction and maintenance of natural gas pipelines. To avoid this practice, NOVA uses pulldown or truck-mounted compressors to push natural gas into sealed sections of pipeline. The company also has implemented a specialized welding technique called "buttering" that allows a pipe stub to be welded onto an in-service pipeline at full or near-full line capacity. The pre-installation of valves and improved planning has also reduced the need for blowdowns. In 1997, these methods reduced emissions by 547 kilotonnes of carbon dioxide equivalent.

PetroCan — VCR expansion up the supply chain

In addition to other voluntary actions, Calgary-based PetroCan has adopted the corporate practice of encouraging their suppliers to consider getting involved in the Voluntary Challenge and Registry. Many of their suppliers, principally from the commercial sector and small to medium sized industrial companies, have been identified as desired target sectors for expansion of VCR. VCR has had a large number of calls from these PetroCan referrals who were previously unaware of the climate change issue and the need for taking action.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the energy sector?

2. What actions can be taken in the energy sector?

Energy	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

If you want to write the answers to these questions or send them back to us, see page 4–25.

Sector 4 — Forestry and forest products

The forest sector in Alberta has spent considerable effort on minimizing greenhouse gas emissions, mostly through voluntary energy efficiency initiatives. The pulp and paper segment, which is responsible for over 70% of the forest sector's direct GHG emissions, has achieved a reduction of 16% from 1990 to 1997, despite a 24% increase in production. This reduction has been largely due to a significant replacement of fossil fuel usage by biomass. Sawmill residues, other wood wastes, spent liquor and organics in wastewater effluent have been used. Additional initiatives include incremental steps in improving energy efficiency, switching fuel to cleaner burning natural gas, and increased use of recycled fibre as feedstock.

Opportunities for reducing greenhouse gases include the following:

- **Using technology to improve energy efficiency of existing equipment**

Technologies can improve the energy efficiency of existing equipment and processes and make incremental changes to optimize overall energy use. Many of these low cost opportunities are already being pursued in the pulp and paper and wood products sectors. The goal is to optimize the use of energy by shifting the focus from the performance of individual components to the performance of the process as a whole. The approach is relatively inexpensive and payback times are reasonably short.

- **Adopting more energy efficient processes and equipment**

The adoption of new, energy efficient processes and equipment has great potential for significant energy reductions, but this is highly dependent on capital stock turnover and the relative economics compared to existing fuels. Studies suggest that there are almost 50 technologies and measures to reduce energy and emissions in the industry ranging from co-generation of steam and electricity to advanced turbine systems for natural gas or biomass gas, real-time energy monitoring, and others.

- **Encouraging fuel switching to biomass or cleaner fossil fuels**

The industry is already well advanced in the use of biomass for energy, but there are possibilities for increasing the replacement of fossil fuels. The current use of wood residues is well below the potential supply.

Examples

Fuel Substitution — Weyerhaeuser — Drayton Valley Power Ltd.

All of Weyerhaeuser Canada's operations are participating in the Voluntary Challenge. For the period 1990 – 1995, Weyerhaeuser's Canada-wide greenhouse gas emissions declined from 607 kilotonnes to 530 kilotonnes. One example of a success story is the cogeneration project with Drayton Valley Power Ltd. The project commenced operations in April 1996. It is based on burning hog fuel produced at the Drayton Valley stranded board and lumber mill and provides 10.5 megawatts of capacity. All power produced will be sold into the Alberta power grid. The project will result in a reduction of 80 kilotonnes a year in CO_2 emissions.

Sweden uses tax credits to develop forestry industry

At the present time, much of the machinery used by companies to develop Alberta's forest resources is made in Sweden. This is a result of a concerted strategy by Sweden to make its forest processing machinery industry pre-eminent in the world. Two critical elements of this strategy involved tax credits to Swedish industry. R&D tax credits were provided to the companies that developed the machinery. Perhaps more importantly, tax credits were available to Swedish forest products companies who installed and used machinery and equipment of Swedish manufacture. By promoting both the development of equipment and the early sales that enabled the equipment manufacturers to establish themselves in the marketplace, the Swedish government has ensured a world-wide industry for its companies. Regardless of the future of Sweden's own forest products industry, the success of the machinery and equipment industry ensures that Swedes will have jobs for decades to come. Although this example does not involve reduction of GHGs, it illustrates the potential of the strategic use of taxes to benefit development of appropriate technology and competitive advantage.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the forestry sector?

2. What actions can be taken in the forestry sector?

Forestry and forest products	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

If you want to write the answers to these questions or send them back to us, see page 4–25.

Sector 5 — Manufacturing and processing

As noted earlier in the workbook, the manufacturing, mining and industrial processing sectors combined contribute about 31% of Alberta's greenhouse gas emissions (Figure 9). The major strategy in this sector is to use technology to mitigate and reduce greenhouse gas emissions. Many industrial firms have already voluntarily applied GHG mitigating technologies that have increased energy efficiency. However, these may not be sufficient and may need to be combined with economic and market measures or with other options that provide flexibility and support innovation, economic growth and competitiveness.

The options may include building alliances with other companies and stakeholders. For instance, the World Resources Institute (WRI), an environmental organization based in Washington, D.C., recently entered into a partnership — the "Safe Climate, Sound Business" initiative — with the oil and gas company BP Amoco, automaker General Motors, and the agriculture and biotechnology company, Monsanto. All four organizations started with a set of policy recommendations for businesses and governments and now are implementing the business recommendations internally, starting with the measurement of their emissions of greenhouse gases.

Within the Alberta minerals and metals sectors, a host of energy efficiency enhancing technologies are available that are unique to each of the production processes. Fuel substitution from oil, coal or coke to natural gas is suitable for many processes. A more limited set of technologies is also available to address non-energy GHG emissions. Non-energy emissions constituted almost 40% of 1996 emissions from mining and metals sectors.

With an increasing emphasis on strong export growth for Alberta products, a major challenge is to maintain the industry's ability to remain competitive in international markets. Achieving reductions in emissions while increasing export growth will require significant advances in production processes and increased costs. These costs need to be offset by productivity enhancements and/or enhancements in Canada's and Alberta's competitive position wherever possible. Another issue facing the manufacturing and mining sectors, as well as the energy sector, is that demand for their products is dependent on other sectors of Canada's economy. The impacts of increased demands from end-use sectors can affect emissions from the primary manufacturing, mining, metals production and oil and gas sector.

To facilitate implementation of technology to reduce greenhouse gas emissions, a number of different strategies are possible, including:

- Voluntary programs
- Economic instruments such as tax policies, regulations and market conditions

- Technology advancement through R&D, demonstration, and transfer.
- Public education and training to influence energy use.

Examples

Waste reduction

A key priority for Cargill is to reduce waste in all forms at all locations. The company has set an ambitious goal of reducing total waste by 30% worldwide by the year 2000. Efforts are focused on reducing, reusing and recycling hazardous and solid waste, reducing air and water emissions, and conserving water and energy. Cargill achieved a 25% reduction of waste in the first two years of this initiative.

Shell Chemicals Canada uses design features to reduce emissions at new Scotford facility

Shell Chemicals Canada is a newly formed Canadian company that produces and markets petrochemicals used in manufacturing housewares, toys, electronics, appliances and furniture, as well as other industrial applications. Shell Chemicals is proceeding with construction of a world scale ethylene glycol plant on the Scotford chemicals site. It is scheduled for operation in the year 2000. Knowing this facility had the potential to significantly add to emissions of greenhouse gases, Shell took an innovative approach to address the issue. Design modifications were made to reduce emissions including:

- Integration of heating systems for styrene and ethylene glycol facilities
- Contracting 62 kilotonnes of CO_2 annually for recovery and sale — gas that otherwise would have been vented to the atmosphere
- Construction of a cogeneration plant to satisfy heat and power requirements, with excess electricity exported to the Alberta power grid
- Incorporation of high selectivity catalyst to reduce CO_2
- Elimination of glycol incineration facilities by securing sales for all produced materials.

Implementing these and other design improvements at the new Scotford facility has resulted in a more eco-efficient facility, combining improved environmental and economic performance. CO_2 emissions have been reduced by 38 kilotonnes.

Dow Chemical improves energy efficiency

Dow Chemical has taken steps to improve energy efficiency. Older, less efficient facilities are being replaced with modern efficient facilities. The recent construction and subsequent planned expansion of the Dow ethylene plant in Fort Saskatchewan, combined with the closure of a 30-year-old ethylene plant in Texas, will result in a 60% improvement in energy efficiency per unit of production. Dow is also looking at steam injection as a way to reduce CO_2 emissions. Although co-generation is a very

environmentally friendly technology, application of steam injection on a turbine will further reduce net CO_2 emissions in Alberta. This modification will allow the production of more power, thereby reducing purchases from a coal-based utility. Estimates are that total CO_2 emissions will be reduced by 5 kilotonnes per year. In addition, NO_X reductions should be reduced by 525 tonnes per year.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the manufacturing and processing sector?

2. What actions can be taken in the manufacturing and processing sector?

Manufacturing and processing	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

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Sector 6 — Transportation

Transportation plays a key role in our economy's competitiveness. In Canada, transportation accounts for about 16% of the final cost of goods and services. In Alberta, with our geography and distance, transportation can account for as much as 50% of the final selling price of some bulk commodities. In comparison, in the U.S., transportation represents about 9% of the final costs of goods and services. Distance from major markets also increases greenhouse gas emissions. In Canada, the transportation sector is responsible for 26% of greenhouse gas emissions. In Alberta, the transportation sector is responsible for 19% of Alberta's greenhouse gas emissions (Figures 8 and 9). The transportation sector — including automobiles and trucks, rail and aviation — faces a serious challenge to reduce greenhouse gas emissions.

Strategies for addressing greenhouse gas emissions include the following:

- **Trucking industry practices**

The trucking industry is projected to have one of the highest growth rates in the transportation sector. The trucking industry currently is investigating ways of reducing greenhouse gas emissions in cooperation with the Clean Air Strategic Alliance and the government. Options being explored include reduced speeds for trucks, improved driver behaviour, and improved fleet management practices.

- **Technology**

The objective of reducing greenhouse gas emissions is a strong impetus for developing new technologies. General Motors Corporation is developing a fuel-efficient diesel-electric bus that will be tested in New York in 2000. Earlier sections of this workbook talked about steps being taken by Honda and Toyota as well as the Ford/Ballard Power Systems/DaimlerChrysler actions to develop vehicles powered by fuel cells. Here in Alberta, the government has provided financial support for the University of Alberta's research into a solar powered vehicle.

- **Economic incentives**

One of the drawbacks of technological solutions is the time it takes for new technology to be incorporated into the mainstream. It takes about 12 years for entire fleets to turn over. However, economic incentives can be used to speed up implementation of technological innovations. The U.S. for example, is considering a plan to use tax credits to encourage a move to energy efficient vehicles. Other incentives include a combination of fees on vehicles with higher fuel consumption and rebates for using fuel-efficient vehicles. In its 1999 budget, the government of British Columbia provided for a partial provincial tax exemption for alternative fuel and hybrid vehicles — up to a $500 rebate after sale.

- **Municipal actions**

Municipalities have an important role to play in reducing greenhouse gas emissions through the efficient use of their busing fleets and through exploring effective transportation options. The City of Calgary, for instance, is exploring ways to use land use planning to encourage the location of population centres close to employment centres and to increase density, both of which can have long term benefits in reducing energy consumption. Increasing public transit ridership is also an option. On a typical commute to work in the City of Calgary, the average car emits 2.5 to 3 kilograms of carbon dioxide. By switching from automobile to bus, emissions can be reduced by 80% to 90%. Travel by rapid transit is even more effective, and can reduce emissions by 90% to 95%. Another opportunity is to replace existing fleets of transit buses with newer, more energy efficient vehicles.

Examples

City of Edmonton

The City of Edmonton is purchasing new transit buses that are 18% more fuel-efficient than the current bus fleet. Under the current schedule, the City of Edmonton's transit fleet will be replaced by the year 2008.

CN Rail

Calgary-based CN Rail is taking delivery of 180 of the most efficient locomotives in their industry. The new locomotives deliver 4300 – 4400 horsepower with 17% less fuel consumption. This advantage results in savings of millions of dollars as diesel fuel costs represent approximately 8% of CN's operating budget.

CPR reduces fuel consumption and greenhouse gas emissions

CPR is actively pursuing a number of initiatives to reduce fuel consumption and greenhouse gas emissions. CPR is currently renewing its locomotive fleet with high-horsepower units employing alternating current (AC) technology. By the end of 1999, CPR will have 345 AC units, which will fully renew 40% of its high-horsepower road fleet. The new AC locomotives are approximately 17-20% more fuel efficient than traditional locomotives. CPR is also reducing greenhouse gas emissions from idling locomotives, making improvements to track infrastructure, upgrading equipment, and expanding and upgrading its intermodal freight terminals to facilitate expansion of rail transportation.

Think about these questions . . .

1. Who can contribute to reducing GHG emissions in the transportation sector?

2. What actions can be taken in the transportation sector?

Transportation	Individual Actions	Business Actions	Institutional Actions	Government Actions
Technology/ R&D				
Market Mechanisms				
Policy				
Education				
Alliances				
. . .				

3. What, if any, barriers need to be removed or incentives given to facilitate the action?

4. What, if any, coordinating function is required to optimize activities?

If you want to write the answers to these questions or send them back to us, see page 4–25.

4.3 Looking across the sectors

You've had a chance to look at opportunities in the six sectors and to identify actions that could be taken. Before we end this section, it's important to step back and look across the sectors to see where there are common threads or where important actions could have been missed.

Think about these questions . . .

Are there common ideas that run across the actions you have identified?

Are there key directions, actions or enablers that need to be taken or put in place?

How do we decide who is responsible for taking the various actions? How can the actions be accomplished?

Are steps needed to coordinate actions both within the sectors and across the various sectors in Alberta?

If you want to write the answers to these questions or send them back to us, see page 4–25.

Agriculture sector

Who can contribute to reducing GHG emissions in the agriculture sector?

What actions can be taken in the agriculture sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Buildings sector

Who can contribute to reducing GHG emissions in the buildings sector?

What actions can be taken in the buildings sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Energy sector

Who can contribute to reducing GHG emissions in the energy sector?

What actions can be taken in the energy sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Forestry sector

Who can contribute to reducing GHG emissions in the forestry sector?

What actions can be taken in the forestry sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Manufacturing and processing sector

Who can contribute to reducing GHG emissions in the manufacturing and processing sector?

What actions can be taken in the manufacturing and processing sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Transportation sector

Who can contribute to reducing GHG emissions in the transportation sector?

What actions can be taken in the transportation sector?

What, if any, barriers need to be removed or incentives given to facilitate the action?

What, if any, coordinating function is required to optimize activities?

Looking across the sectors

Are there common ideas that run across the actions you have identified?

Are there key directions, actions or enablers that need to be taken or put in place?

How do we decide who is responsible for taking the various actions? How can the actions be accomplished?

Are steps needed to coordinate actions both within the sectors and across the various sectors in Alberta?

5. How will we know if we're successful?

Your roadmap to section 5

What should we aim for and how will we measure our success?

In this section of the workbook, we move from specific actions to consider how we would measure our success and whether tangible goals should be set. Is it better to set goals and targets, or should we continue to simply monitor results and progress? What measures should we use?

The key focus of this section is on addressing these questions:

How should we measure success?

In what situations can setting goals help?

What goals should we aim for?

5.1 Why measure results?

Working as a team and adopting a balanced, reasonable goal, Albertans have previously shown independence and innovation in creating new solutions to new challenges. As was stated earlier, Albertans now need to take a leadership role in demonstrating that the wise use of resources creates an Environmental Energy Advantage.

One goal, therefore, is to engage all sectors and all Albertans in responding to the climate change challenge. Having worked through previous sections of this workbook, by now you will have identified numerous ways to do so.

But how do we turn talk into concrete and effective action? Industry has often used the expression: "*What gets measured gets done.*" Organizations have found that real change can result, provided that specific, measurable goals are set. This maxim may be particularly relevant in the context of reducing GHG emissions. If taken in isolation, with no foundation in the practical aspects of day-to-day activities, the benefits of taking action on climate change are remote, while the costs of doing so are fairly immediate. As a result, many people will be tempted to adopt a posture, rather than be encouraged to take action. The Texan expression "all hat and no cattle" comes to mind.

Nevertheless, some caution needs to be exercised before specific, measurable goals are stipulated. If the goals are arbitrary or unrealistic, individuals and organizations will fail to meet them. Little is achieved if inappropriate goals lay the groundwork for failure. The challenge, then, is to establish a strong foundation for suitable goals.

5.2 A reality check — tracking energy efficiency today

Some industries have been tracking their energy efficiency for several years. Their results are summarized in the following chart.

Energy Intensity Improvements as Measured in Some Alberta Industries

Oil and gas

Estimated average direct and indirect emission intensity was 0.467 tonnes of CO_2 equivalent per 10^3m^3 of gas and 0.613 tonnes of CO_2 equivalent per m^3 of oil products. These statistics represent a decrease from 1990 of 6% for natural gas, but no change for oil.

Oilsands

Between 1988 and 1995, Syncrude decreased CO_2 emissions per barrel by 21%. By 2002, they expect to reduce emissions per barrel by a further 32%.

From 1990 to 2000, Suncor predicts that its production will increase by almost 64%, while GHG emissions will rise by only 12%, a 32% improvement in emissions per unit production.

Refining

To help manage their emissions and reduce costs, CPPI members track energy efficiency performance using the Soloman Energy Intensity Index (EII), an internationally recognized benchmarking standard for the petroleum refining sector. An overall EII value of 100 is an indication of good energy efficiency practices. CPPI members decreased their EII to a value of 101 in 1995, from a high of 115 in 1990, a 12% reduction. There is a further commitment to improve EII by one percentage point annually between 1995 and 2000.

Pipelines

Emissions from the pipeline sector have increased by 41% between 1990 and 1995. Oil and gas throughput, however, increased by 28% and 55% respectively, meaning that the emissions per unit throughput for this sector have generally been decreasing.

Petrochemicals

Between 1990 and 1995, the amount of CO_2 produced per kilogram of product was reduced by 52%, and a continued reduction of 58% is projected to occur by 2000.

Forestry

Weldwood of Canada Ltd.'s two mills in Alberta have reduced their CO_2 equivalent emissions per tonne of product by 42% since 1990 (fossil fuel consumption has dropped by 22%, while pulp production has increased by 38%).

5.3 Setting specific targets vs. monitoring results

Alberta industries and companies are both reporting results they have achieved and setting specific, measurable goals for the future. The petrochemicals group, for example, states that it achieved a 52% reduction for the period 1990 to 1995. It intends to achieve a 58% reduction by 2000.

Energy productivity and energy efficiency are not only relevant to industries. They can be used to describe things a little closer to home — in fact they describe our homes themselves. Alberta's buildings have an important role in overall provincial energy efficiency. The residential/commercial sector accounts for 24% of total GHG emissions (Figure 9). Homes have very long lifetimes and small improvements today can make a lasting contribution to reduced emissions. Over the longer term, improvements in the efficiency of homes can result in sustained GHG reductions.

Some say we need measurable goals ... others say we need only to monitor.

Some argue that setting specific, measurable goals is an essential step, whether those are targets for major sectors like energy or forestry, or for the energy efficiency of our homes and cars. Others suggest that the best approach is to track and monitor results, to measure progress over time, rather than try to set arbitrary targets which may not be met.

Think about these questions . . .

In your opinion, is it adequate to report on progress, or do we need to set performance objectives in the form of future specific, measurable goals?

How can we use specific measures and goals to help facilitate action in Alberta?

What are some of the key factors to be taken into consideration with respect to whichever approach you think most appropriate (either monitoring results or setting future goals)?

If you want to write the answers to these questions or send them back to us, see page 5–5.

5.4 How do we measure success?

The primary goal of measurement is to help decision makers evaluate their performance in achieving objectives. It helps understand what sustainable development means in operational terms. Measurement offers *tools* for translating the concepts of sustainable development into practical terms. Indicators are central among these tools.

An indicator can be a variable (for example, the TSE 300) or a function of variables (for example, a ratio, such as recycled versus total amount of industrial waste). An indicator can be a qualitative variable (for example, safe or unsafe workplace practices, participatory or non-participatory decision making), a ranking variable (for example, best or worst training program; lowest or highest rate of unemployment), or a quantitative variable (for example, GDP $/capita or energy use expressed as kWh/year).

A look at the chart on *Energy Intensity Improvements as Measured in Some Alberta Industries* shows that two kinds of indicators are used. Most of the industries use a quantitative indicator, expressed as CO_2 equivalent tonnes per unit of production or throughput. The refining group (members of the Canadian Petroleum Products Institute or CPPI) uses an index which is a function of a number of different variables appropriate for their industry.

The measure we choose should reflect the outcomes we want.

A key factor in deciding how to measure success is to ensure that the performance indicators we choose do, in fact, reflect whatever *outcomes* are most desired. Nothing much is gained from measuring only activity. For example, when evaluating job training programs, it is better to know how many clients were permanently hired at levels commensurate with their training, than it is to know how many clients were processed through the program. The former gives some measure of success; the latter merely gives a measure of throughput.

It is also important that the indicator be useful and appropriate for everyone whose performance will be evaluated. Given that responding to the climate change challenge involves a number of different individuals and sectors, some common denominator needs to be found. Examples of different ways to measure GHG emissions include emissions per unit of Gross Domestic Product and emissions per unit of output.

The Alberta Economic Development Authority suggested that net GHG emissions per dollar of Gross Provincial Product be used to measure energy productivity. An index like this has the potential of measuring outcomes (emissions as a factor of productive value), which could, in most circumstances, at least, be applied to all individuals, businesses, institutions and governments. It would be a useful tool for making individual and collective decisions. For example, comparisons could be made across sectors, to help determine the extent to which threats and opportunities differ for each segment of the Alberta economy. We could also look at the projected growth of Alberta's GDP to predict whether the provincial economy is becoming more or less GHG emission intensive.

Think about these questions . . .

What outcomes should be reflected in however we measure success?

How can we ensure our performance indicators account for many of the unique issues faced by different stakeholders and sectors?

Given that no off-the-shelf performance indicator is available, who (if anyone) do you think should develop the appropriate measurement tool?

If you want to write the answers to these questions or send them back to us, see page 5–5.

In your opinion, is it adequate to report on progress, or do we need to set performance objectives in the form of future specific, measurable goals?

How can we use specific measures and goals to help facilitate action in Alberta?

What are some of the key factors to be taken into consideration with respect to whichever approach you think most appropriate (either monitoring results or setting future goals)?

What outcomes should be reflected in however we measure success?

How can we ensure our performance indicators account for many of the unique issues faced by different stakeholders and sectors?

Given that no off-the-shelf performance indicator is available, who (if anyone) do you think should develop the appropriate measurement tool?

Notes

6. Next steps

Your roadmap to section 6

Back to the basic questions

We've been through extensive background and so far we've discussed:

Whether something needs to be done

Whether something can be done

What actions can and should be taken

How can those actions be accomplished and who is responsible for what

What goals should we aim for and how should we measure success

Now it's time to cycle back to the beginning and address the last two questions:

How do we proceed?

What elements are needed to turn the Alberta Strategy on Climate Change into action?

6.1 How do we proceed?

We've talked about a number of ideas and options. The objective is to identify specific actions that can be taken. The key questions at this point are: How do we proceed? How do we take the actions identified and make sure that action, in fact, happens? What are the next steps and how should they be taken?

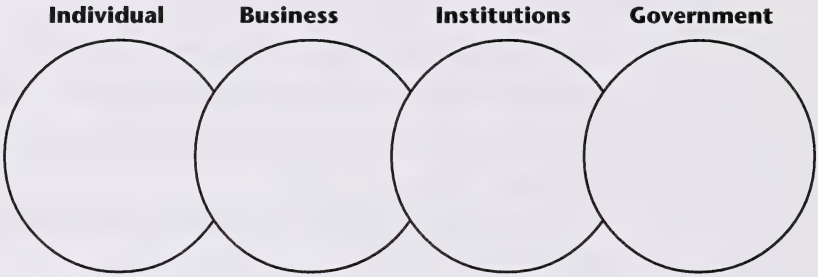
An action plan is more than just buying a new car or changing all the light bulbs in an office tower. It's also about how to understand and manage Alberta's response to the climate change challenge.

When the Government of Alberta announced its Climate Change Strategy, it included mention of Climate Change Central. In section 4 of the workbook, you were asked the question: What, if any, coordination function is required to optimize Albertans' activities? Establishing Climate Change Central is one option for coordinating the next steps, bringing the various parties together, and ensuring that the momentum continues.

If we were to establish Climate Change Central, think about these questions:

- **What would each stakeholder group need from a coordinating agency?**

Individuals, for example, might need information about how they can make a difference in their homes or offices, and where they can most easily find solutions. Institutions might look for opportunities to form alliances with businesses or other organizations in order to increase their energy productivity. Corporations might seek technology R&D partnerships. Government might reach out for policy advice. Please identify what you think are the primary stakeholder needs.



- **What sort of tasks would Climate Change Central undertake?**

Examples of possible tasks include:

Which of these functions would you include? What other functions would you suggest for Climate Change Central?

- Partners program
- Strategic alliances
- Information sharing
- Intelligence gathering
- Benchmarking
- Research
- Policy development
- Advocacy

- **If a private/public partnership were formed to undertake the coordinating role, how would representatives from all sectors — individuals, business, institutions and government — be chosen and included?**
- **How would the organization be held accountable? What kind of reporting mechanisms would it use?**
- **How would the organization be funded?**

Some people have suggested they would be willing to donate money to a research fund or second staff to Climate Change Central. What would you or your organization be willing to contribute? What would you need to facilitate your contribution?

Think about these questions . . .

Would a Climate Change Central provide an effective means of coordinating action?

What other steps do you think Albertans should take?

If you want to write the answers to these questions or send them back to us, see page 6–5.

6.2 What elements do we need to turn Alberta's Climate Change Strategy into action?

Alberta's Climate Change Strategy sets a broad framework for future action. The purpose of this Round Table discussion is to put some meat on the bones . . . to flesh out actions that could be taken and to set the stage for a strong leadership role for Alberta.

The key questions have been addressed. Hopefully, we've reached a consensus on many of them . . . the need for prudent action, the confidence that actions and solutions can be developed here in Alberta, some preliminary ideas on specific actions that could be taken, and goals we should set and how our progress should be measured.

We've also established Alberta's criteria for success — an expression of what we stand for, and the fundamental objectives we are trying to achieve.

Now we need some focus — five or six core elements that will provide a workable framework for action.

Think about these examples:

- In February of this year, for example, President Clinton proposed a $4.1 billion dollar effort to reduce the threat of global warning. Elements of his plan include a fund aimed at stimulating technological innovation and local revolving funds and other mechanisms to enable communities to respond through public-private partnerships.
- The Energy Council of Canada has proposed a communications element, the ABC Initiative, which includes an annual grass roots campaign to collect and quantify greenhouse gas emission reductions flowing from actions taken by individual Canadians.
- The Alberta Economic Development Authority and others have suggested that continuing economic analysis and development of useful performance indicators is an important element, together with a market intelligence function to identify economic

opportunities and research on socio-economic impacts of climate change and climate mitigation on Albertans.

- Many have emphasized the need for an information clearing house, and a means of building alliances between individuals, businesses, institutions and governments within Alberta as well as nationally and internationally.

Having worked through the section on what needs to be done, and identifying what kinds of actions can and should be taken in Alberta, how would you summarize the central components of a joint plan for Albertans to address climate change issues?

Think about these questions . . .

How do we meet the objective we set . . . to put the meat on the bones and provide a workable framework for future action?

What elements do we need to turn the Alberta Strategy on Climate Change into action?

If you want to write the answers to these questions or send them back to us, see page 6–5.

Would a Climate Change Central provide an effective means of coordinating action?

What other steps do you think Albertans should take?

How do we meet the objective we set . . . to put the meat on the bones and provide a workable framework for future action?

What elements do we need to turn the Alberta Strategy on Climate Change into action?

Notes

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